TECHNOLOGY DEPT.

ELECTRICAL REVIEW

FRIDAY
OCTOBER 1958

WEEKLY
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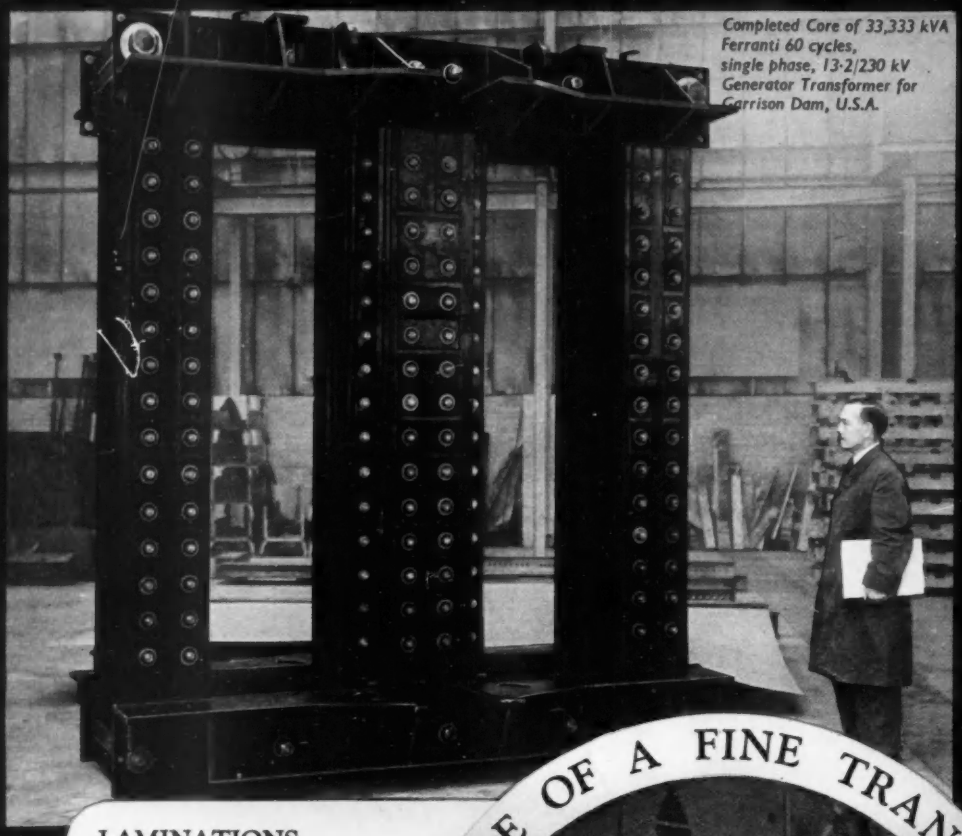
G.E.C.

The main hall of the Errochty Power Station of the North of Scotland Hydro-electric Board. For this station, which is designed for completely automatic operation by remote control, the G.E.C. supplied three 25 MW vertical-shaft alternators, auxiliary motors and the majority of the control gear.

power generation

THE GENERAL ELECTRIC COMPANY LIMITED, ERITH, KENT, ENGLAND



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of all types, in all sizes and in all grades of material.

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hot-rolled and cold-reduced electrical sheet and strip, and hot-rolled transformer sheet.

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cold-reduced oriented transformer sheet and strip.

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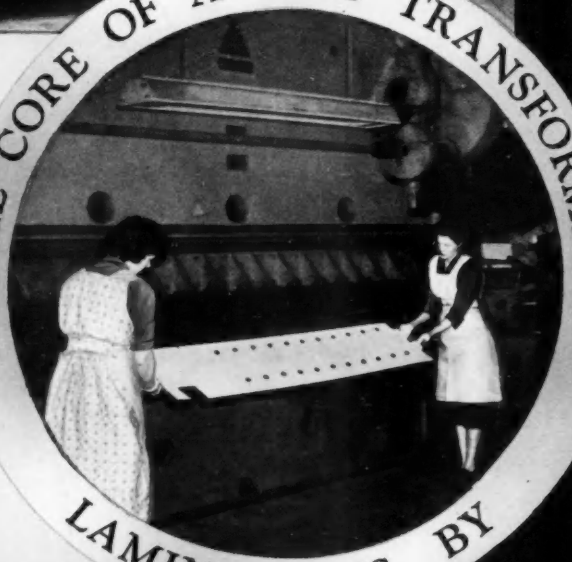
Our Cookley Works is one of the largest in Europe specializing in the manufacture of laminations for the electrical industry.

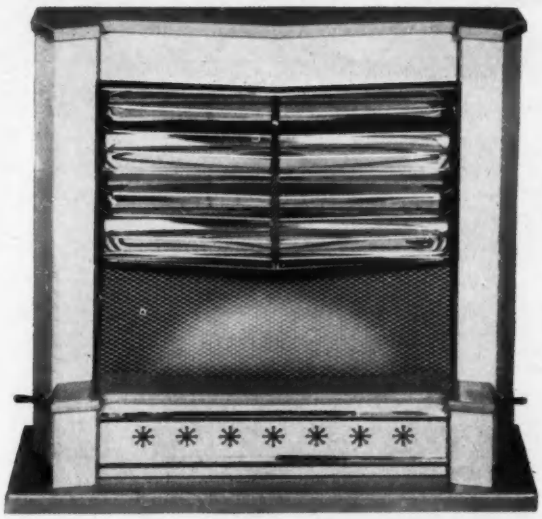
THE CORE OF A FINE TRANSFORMER



LAMINATIONS BY

RTB

Heatrae of Norwich



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Remember

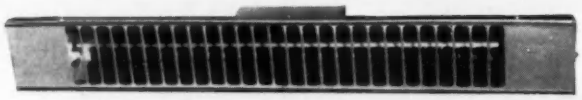
Poppy Day

A

Taking a leaf out of the Wiggin book

A heater with a difference

BRIGHTRAY 'C'



The 'Radisil' radiant heater

we all take it for granted that hot bodies radiate heat, yet probably rather few of us are familiar with the nature of this 'heat' What we call radiant heat is an electromagnetic radiation similar to visible light. In the electromagnetic spectrum, of which visible light covers only a small section, this radiation occupies a band of wavelengths rather longer than red light, between about 1,000 and 0·75 microns, and hence it is known as infra-red. Certain materials absorb infra-red rays in the same way that they absorb different colours of light: but in so doing they become heated Like light rays, infra-red radiation can be reflected and refracted. All radiant electric fires generate these rays and emit them into space or onto the surface to be heated

Hanovia Limited of Slough have recently produced a new type radiant heater called the 'Radisil', intended to be mounted high up on a wall or on a ceiling, and for which the makers claim a number of advantages over some of the more conventional electric fires.

One of the main considerations in industrial heating is the ability of the appliance to evaporate water The 'Radisil' is reputed to be particularly useful in this field since it gives out infra-red rays with a peak emission close to 3·0μ and very near the maximum absorbtion wavelength of water. At this wavelength most other materials absorb much less radiation than water so that the heater can be used to dry them out, without greatly raising their temperature. This property makes it a very useful piece of apparatus for drying prints, photographs, textiles and even soap.

The penetrating nature of the radiation provides an additional safeguard against fire, since clothing or paper, even when it is touching the grille will rarely absorb enough radiation to catch fire.

The essential difference between this new heater and the more conventional models lies in the heating element. In most forms of electric fire, the element consists of wire supported on some insulating base – usually a ceramic. A few have the wire buried in the insulator itself while in some others the wire is packed with an insulating material and enclosed in a metal sheath. In this case the spiral of wire is enclosed in a silica tube, with Brightray 'C', which is one of the standard grades of nickel-chromium electrical resistance wire produced by Henry Wiggin & Company, being used for the coil. This spiral is stretched down the inside of the tube so that it acts as a spring whose tension holds the terminal caps in position at either end of the tube. Complete enclosure of the heater wire makes it possible to raise it to the high temperature necessary to cause the radiation for a

1 *An industrial type 'Radisil' heater*

2 *The Electromagnetic Spectrum showing the position of infra-red wave band and the extent of the 'Radisil' emission*

3 *The element displayed to show its construction*

4 *Graph showing one relationship between the radiation given out by the heater and that adsorbed by water*

Articles dealing with engineering developments in many fields appear regularly in 'Wiggin Nickel Alloys'. Topics discussed here can spark off ideas for a new approach to your own problems of extreme temperatures, corrosion, oxidation, mechanical stress, or electrical resistance.

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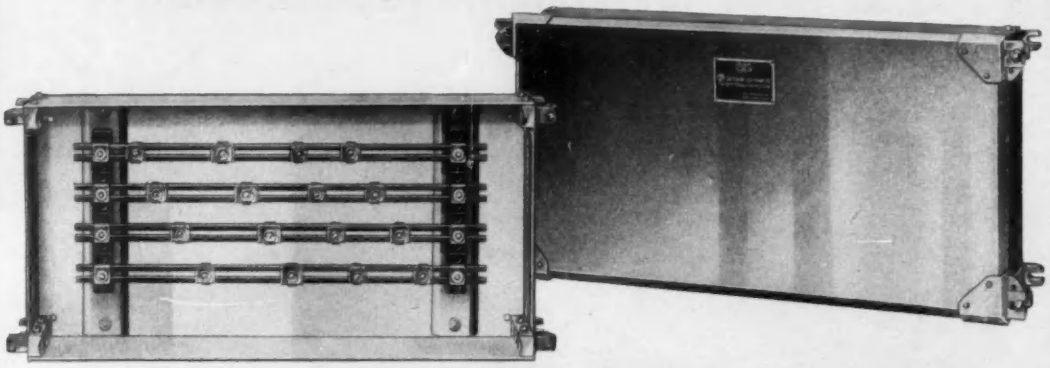
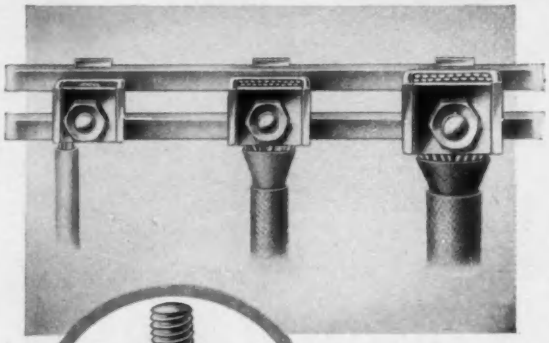
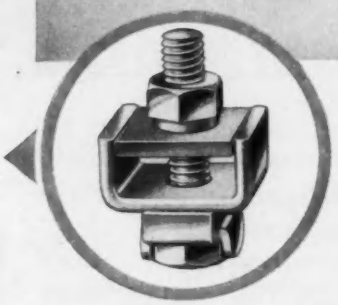
MINIBAR BUSBAR CHAMBERS







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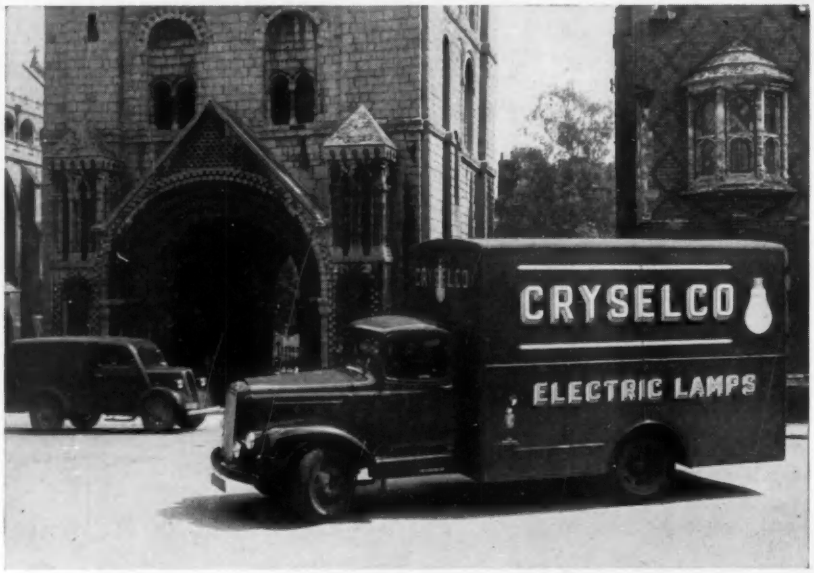

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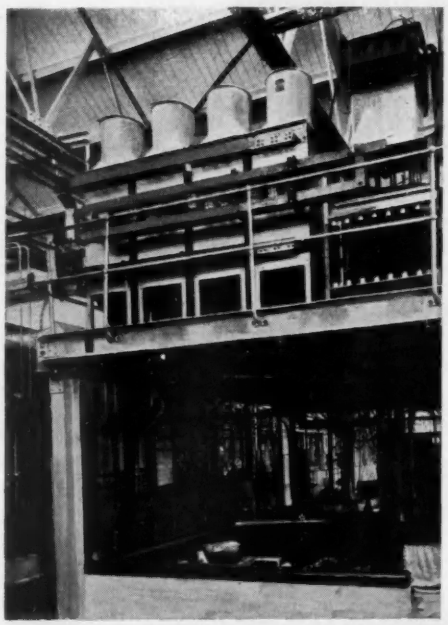
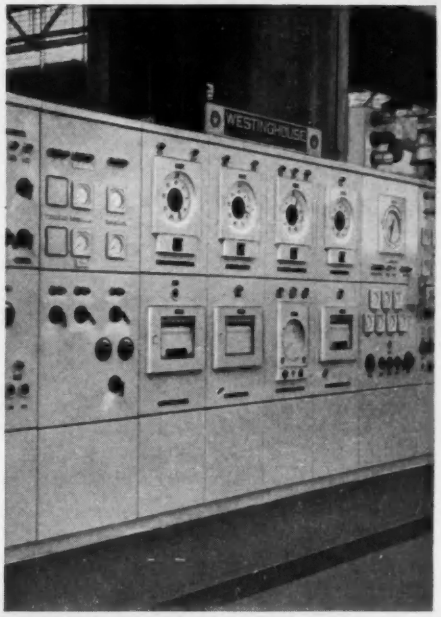


1936 *Part of a 50 000 ampere copper-oxide rectifier installation at Joseph Lucas Ltd.*



1958 *Part of the control panel of one of the electro-tinning lines of The Steel Company of Wales Ltd., Velindre, employing 450 000 amperes of water-cooled Westalite rectifiers.*

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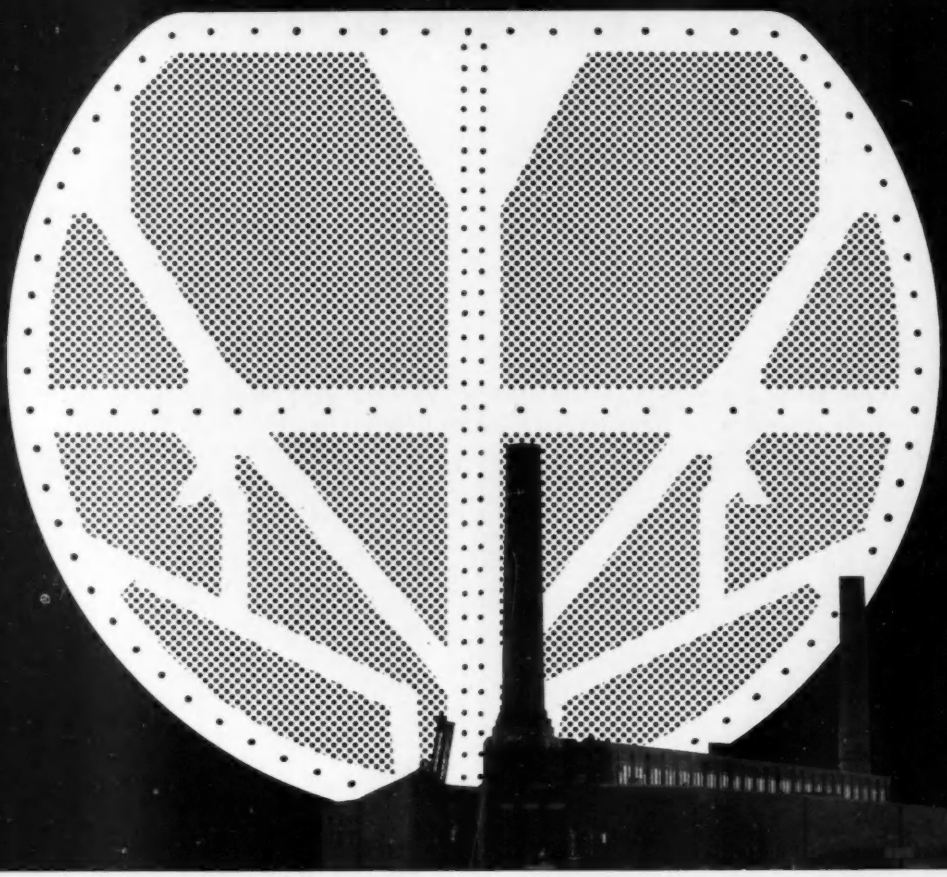

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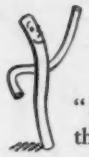
"Ever thought of coal-crushing as a career?"

they asked us.



"Er . . . no" we confessed—not realising that anyone crushed coal on purpose.

"A job of National Importance" they tempted us.

"O.K., we'll take it," we agreed.

"Don't run away with fancy ideas," they warned, "your job will be insulating the electric motors that operate the plant."

"A pushover," we replied recklessly.

"If you don't mind working entirely without ventilation" they said "totally enclosed by welded-in sheet steel covers. Gets kind of hot"—they added nastily.

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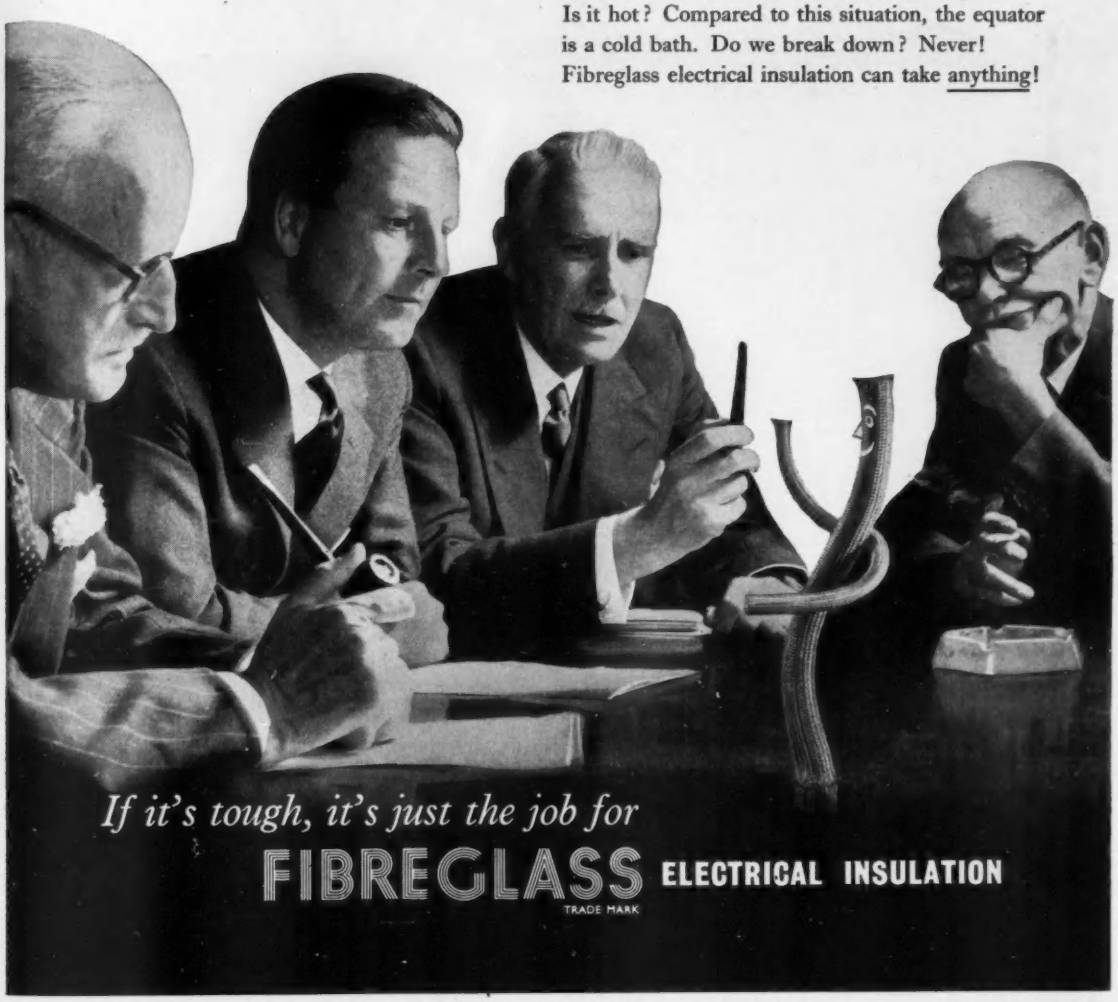

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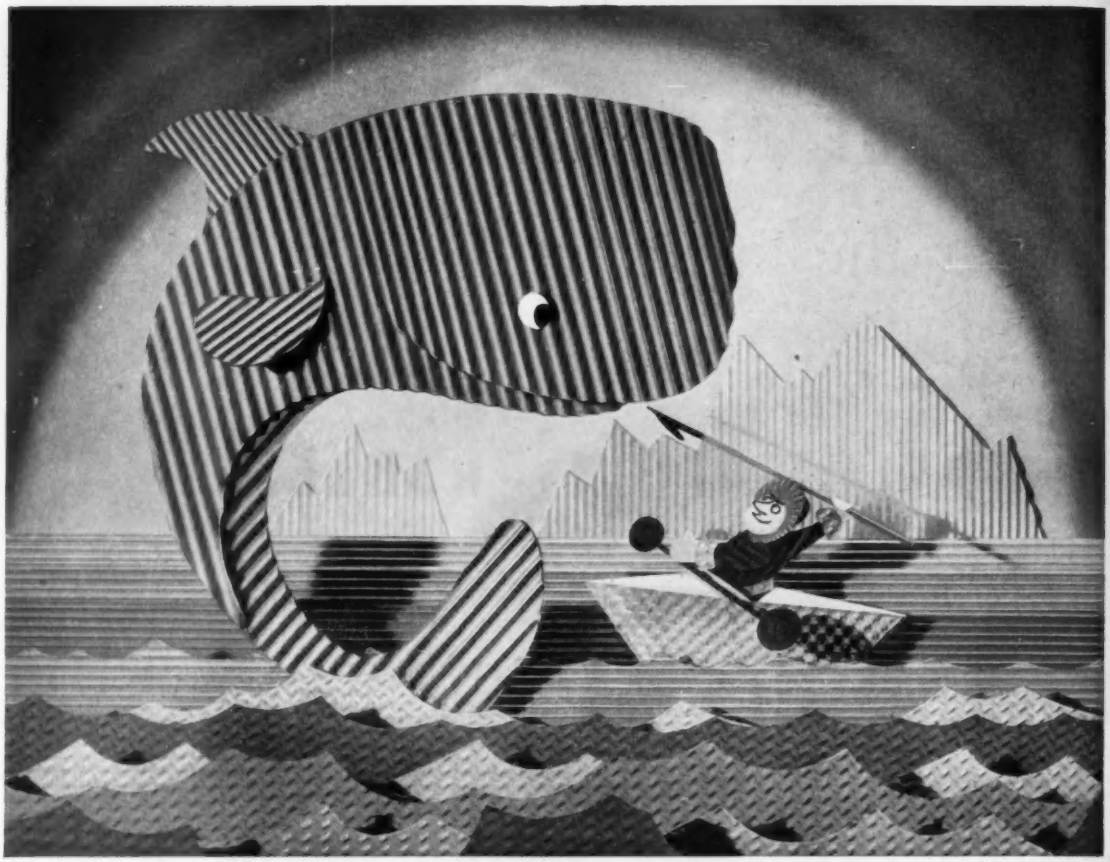

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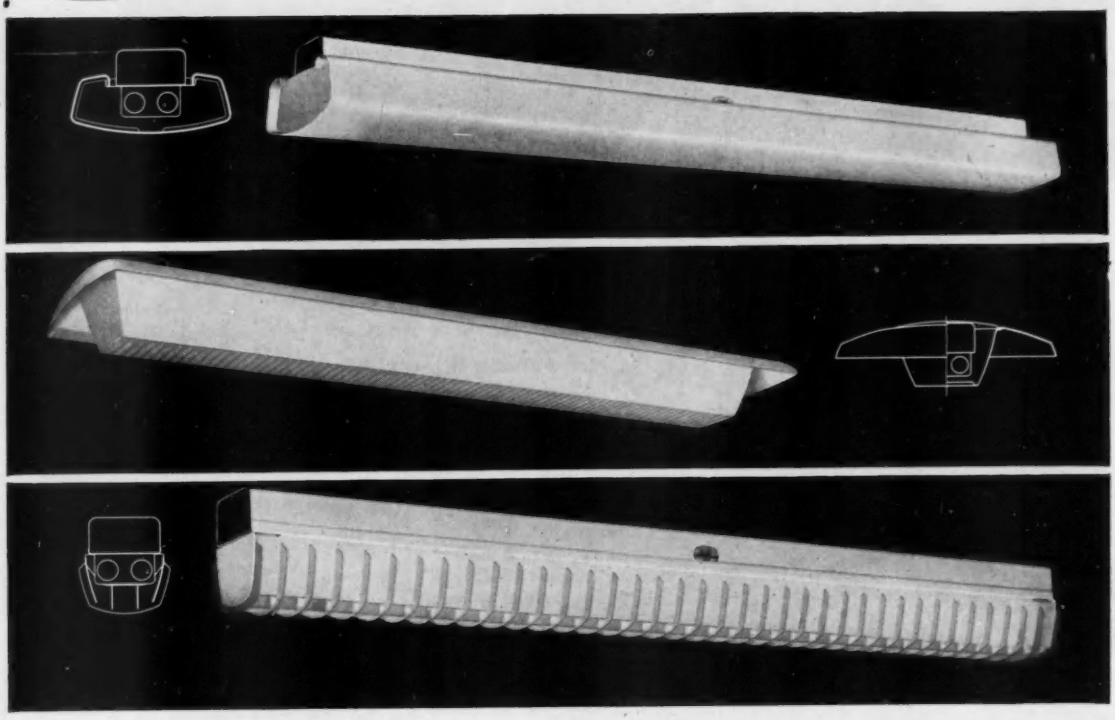

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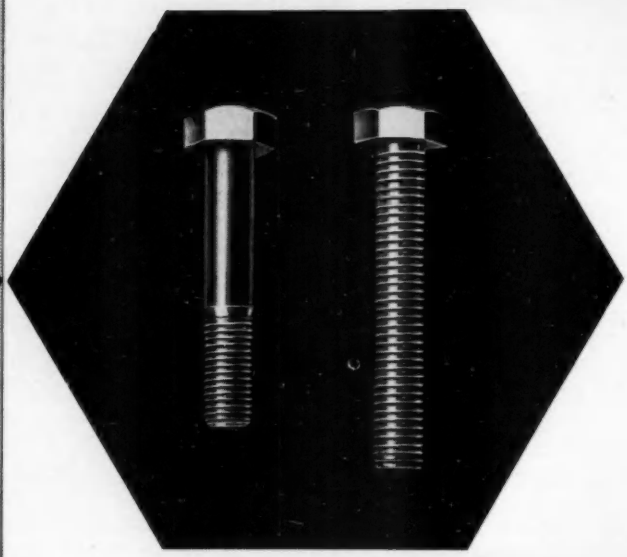

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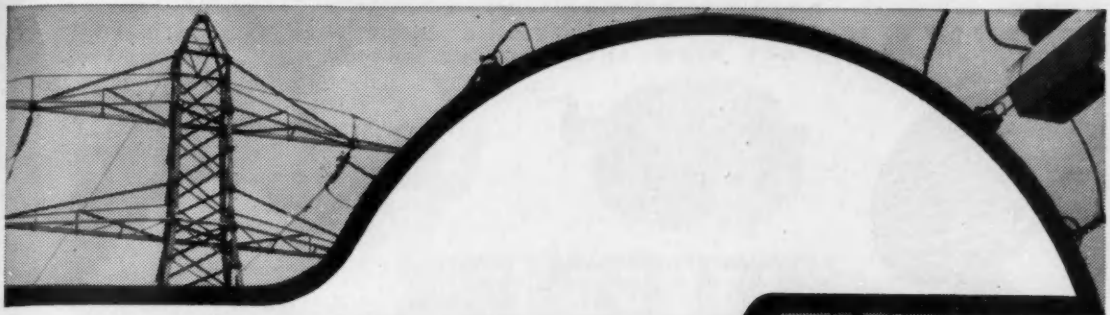
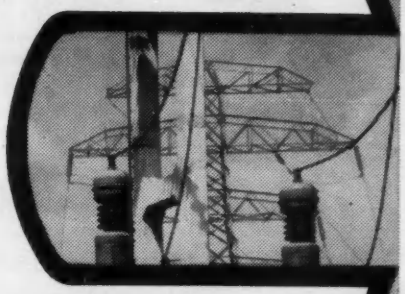
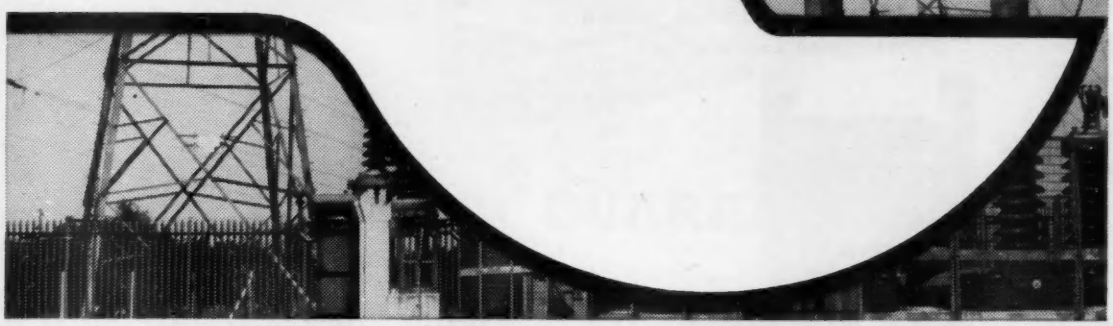
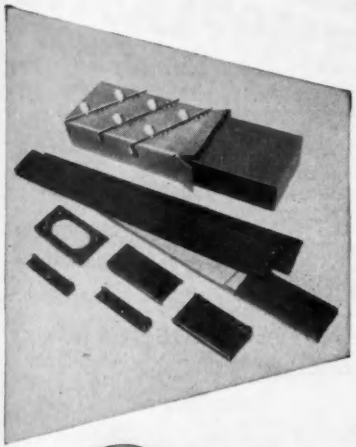




Consider Simplicity



in POWER FACTOR CORRECTION



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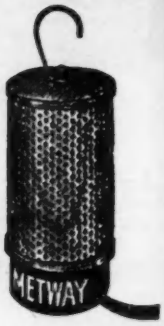

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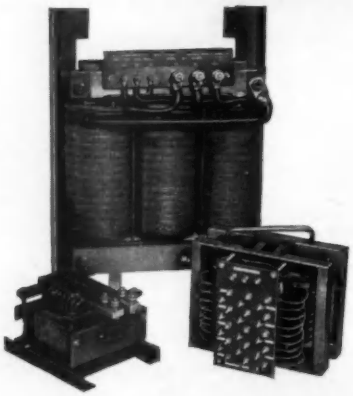

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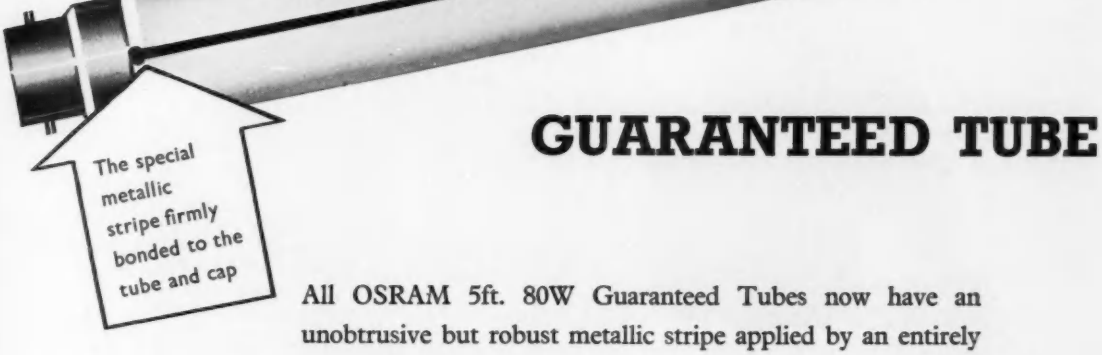

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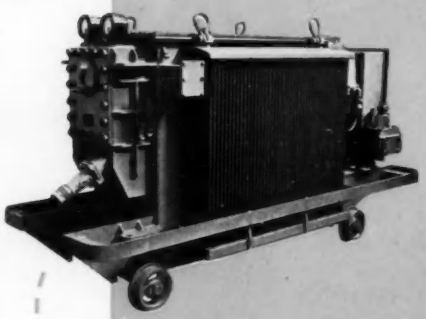

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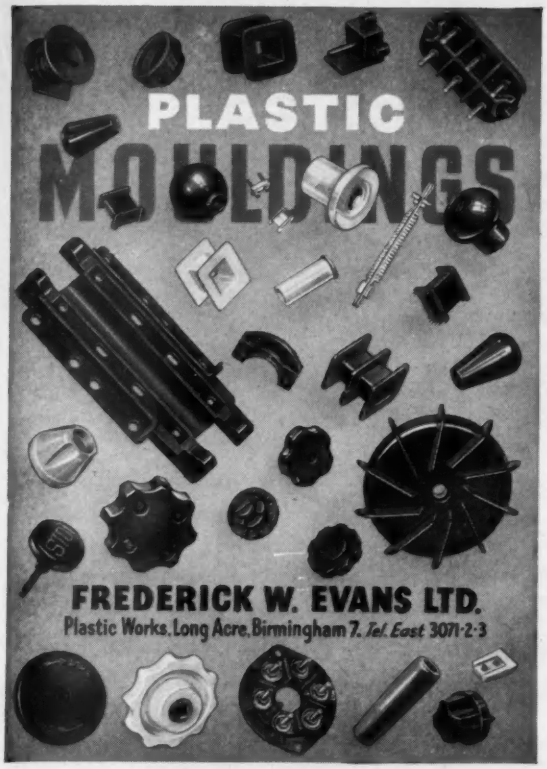

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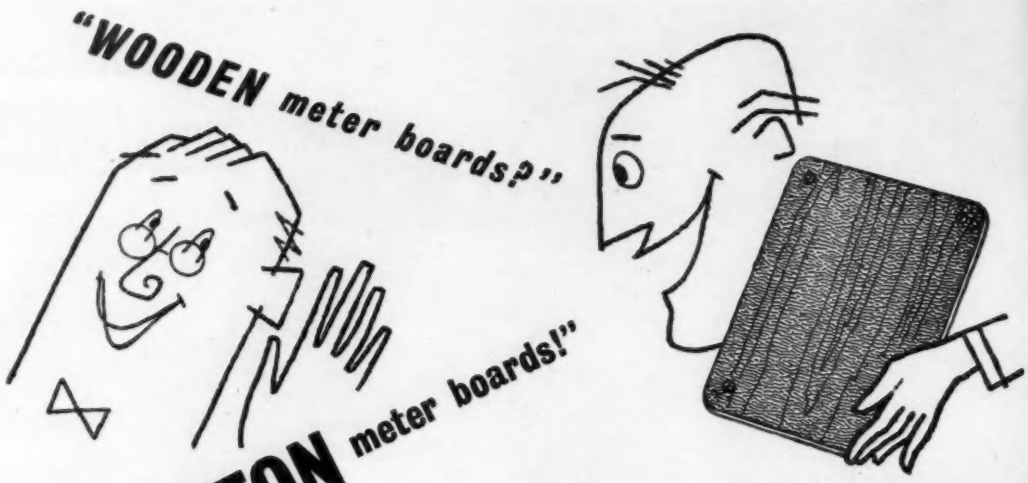

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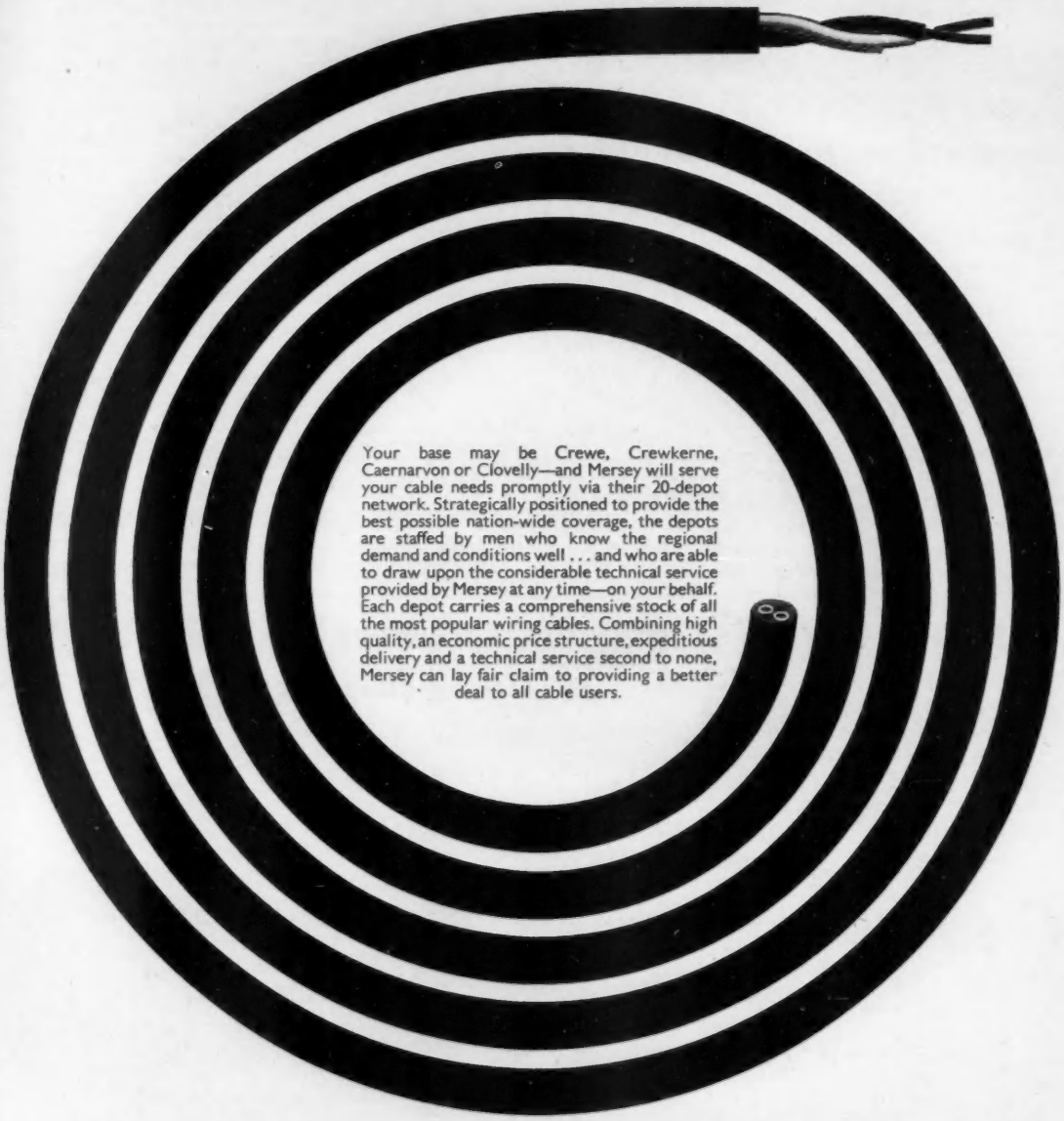

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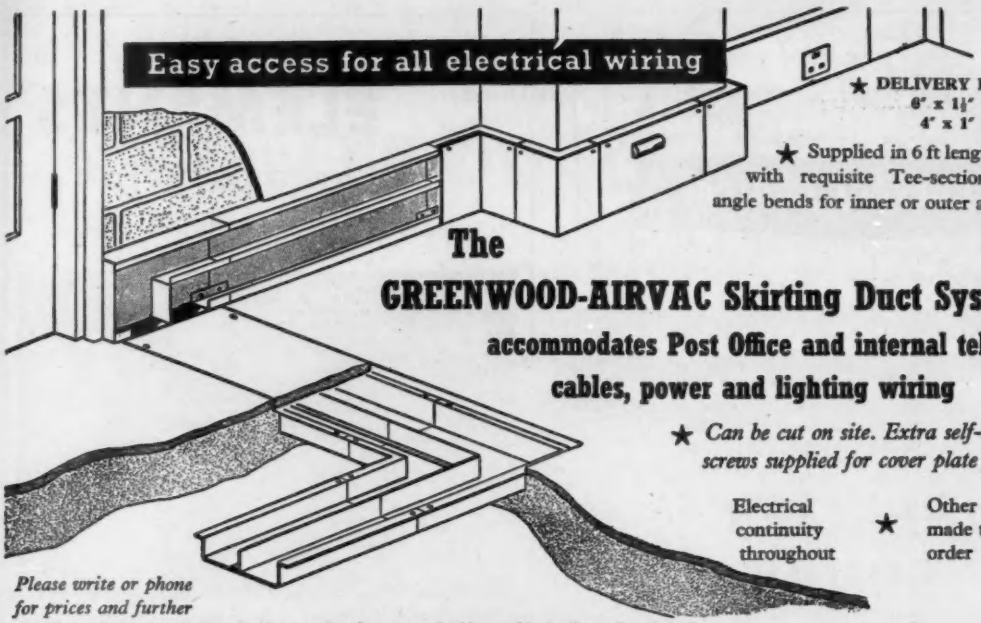

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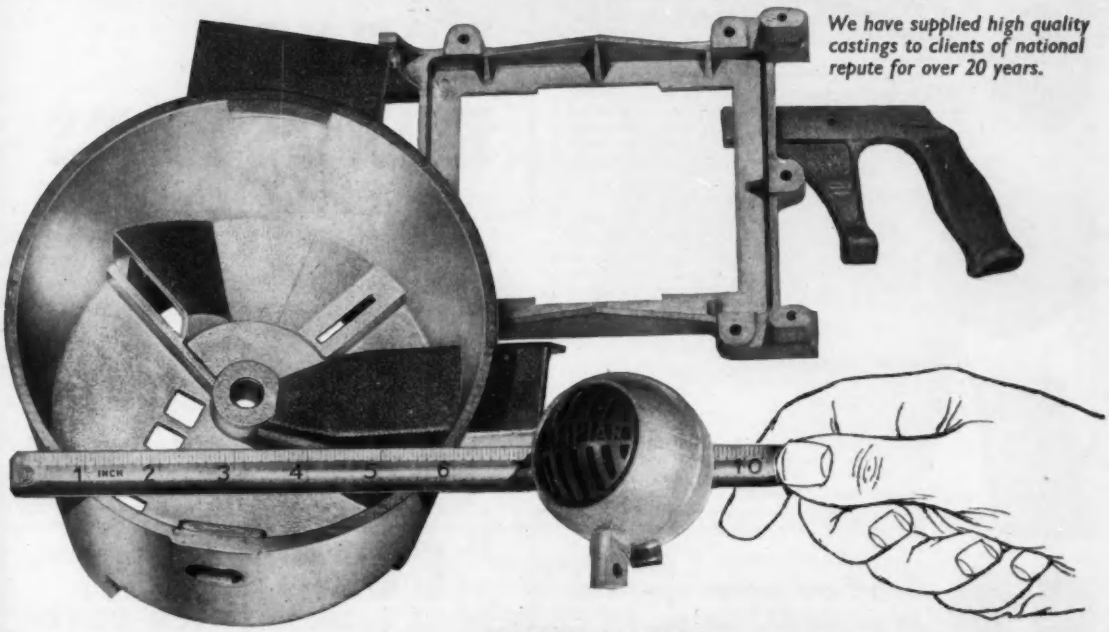

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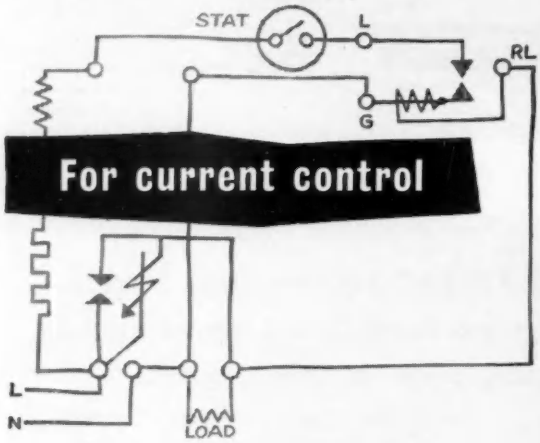

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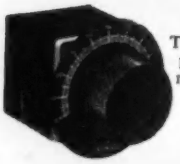

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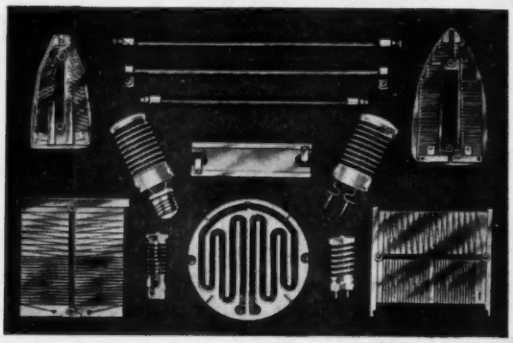

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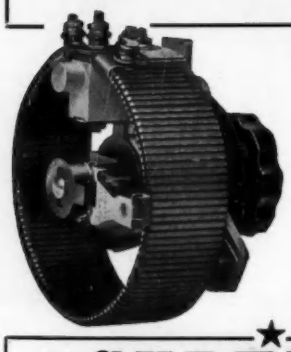

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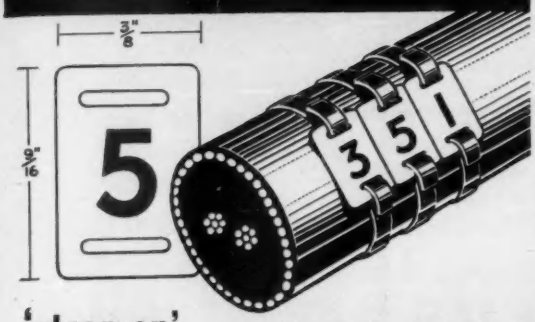

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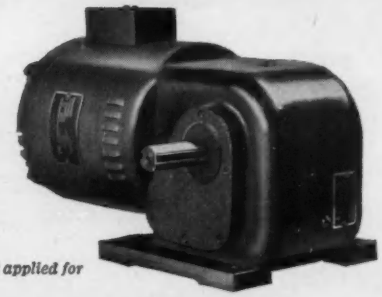

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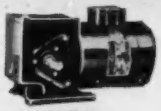

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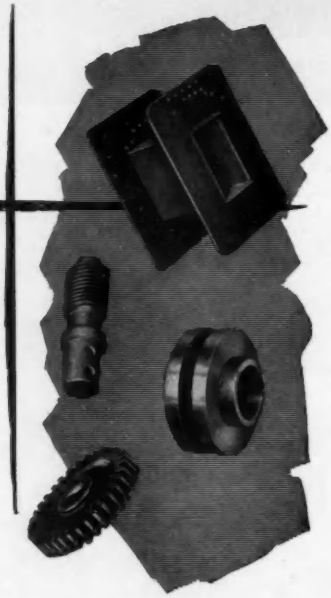

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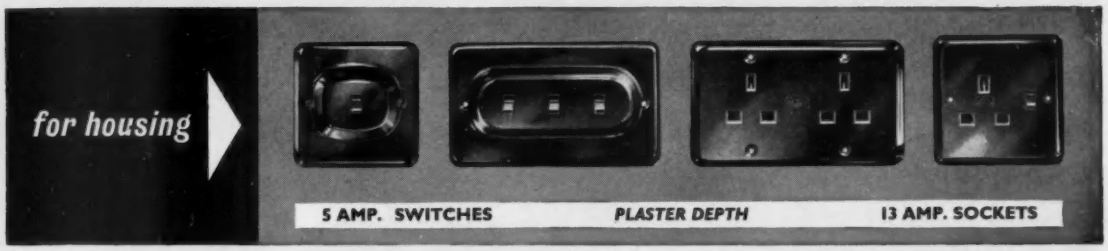

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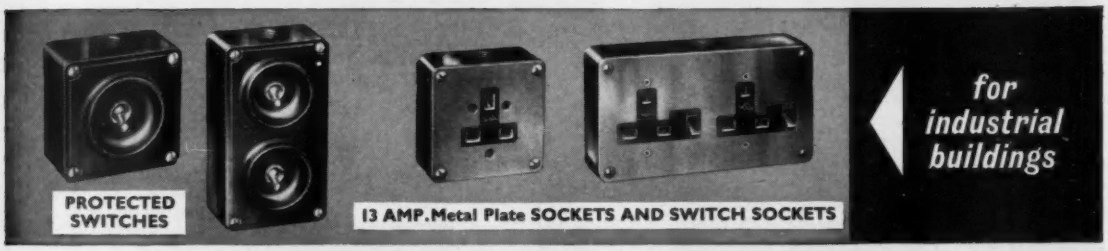

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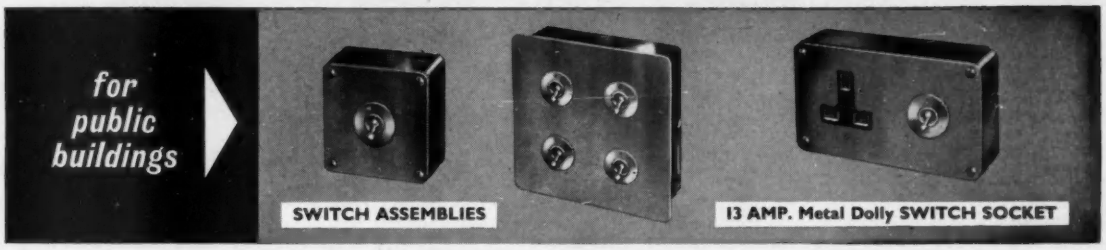

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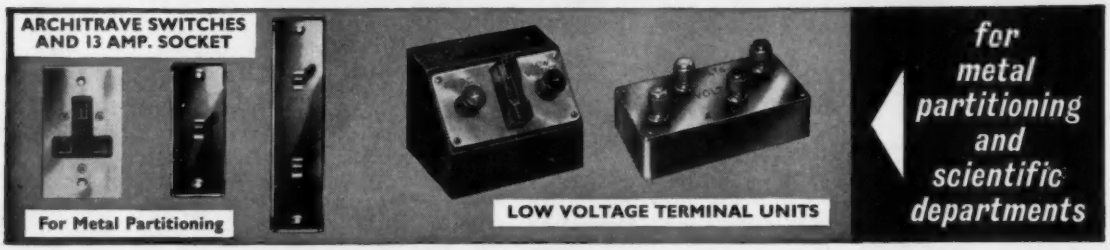
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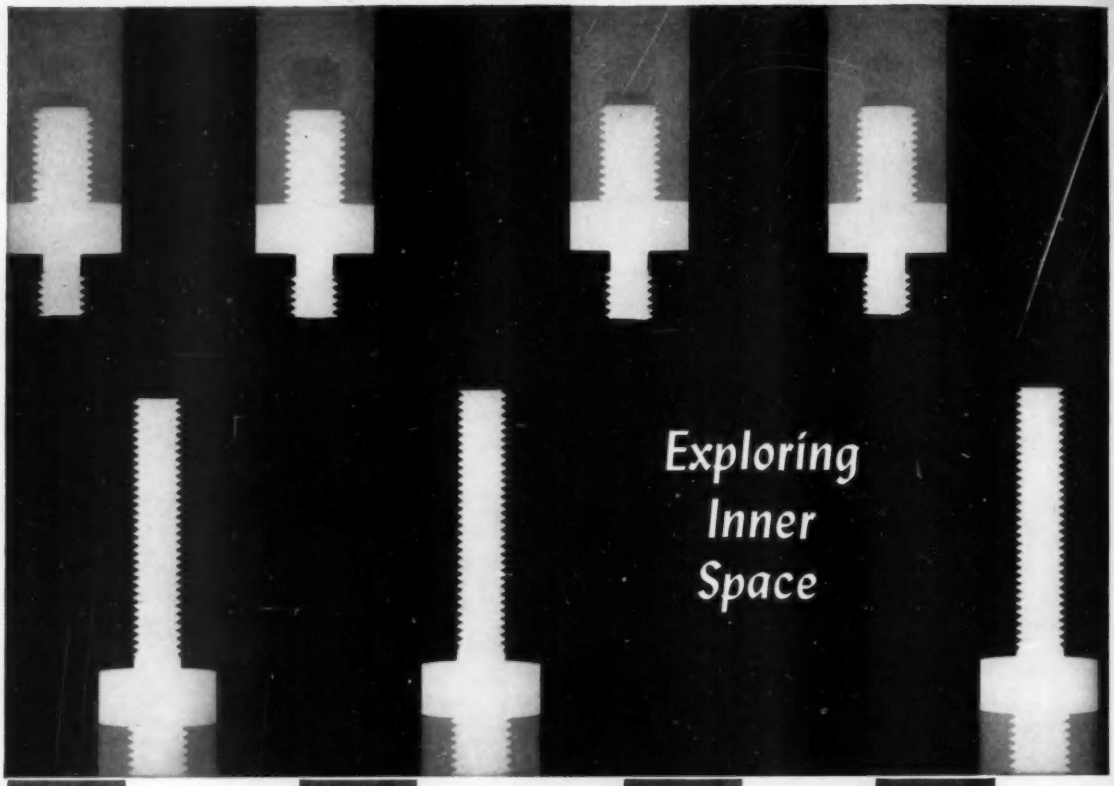

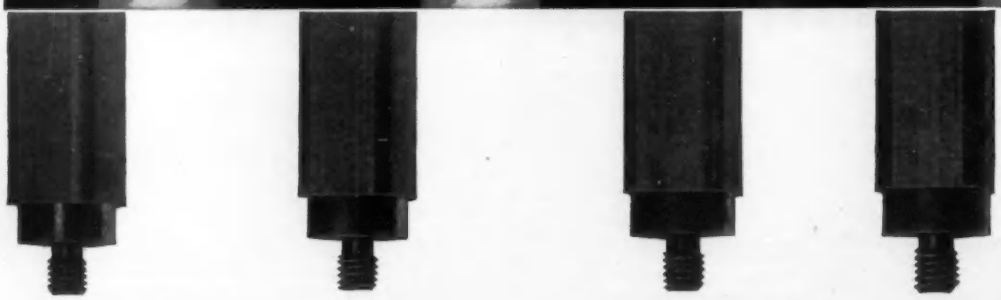

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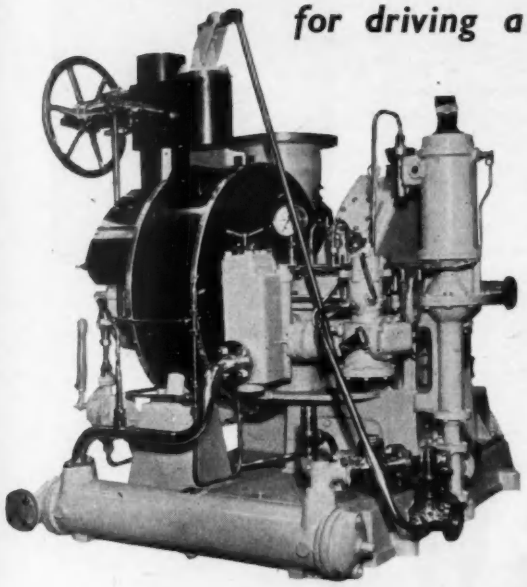

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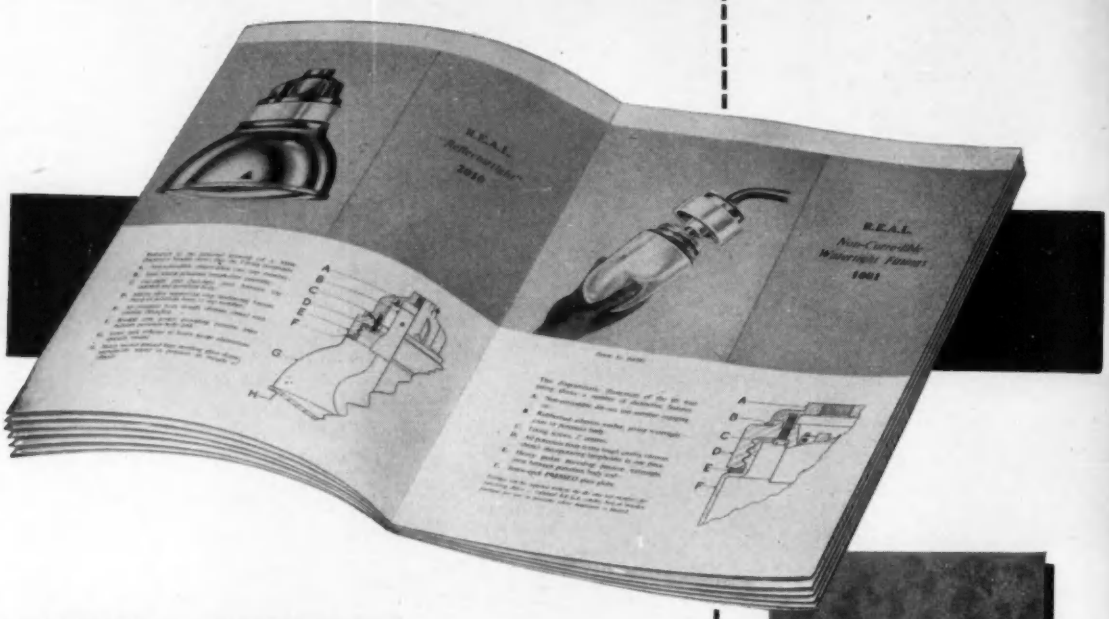

A NEW catalogue, illustrating non-corrodible lighting fittings. Of great value to consultants and illuminating engineers.

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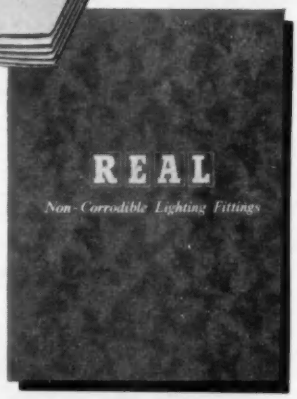

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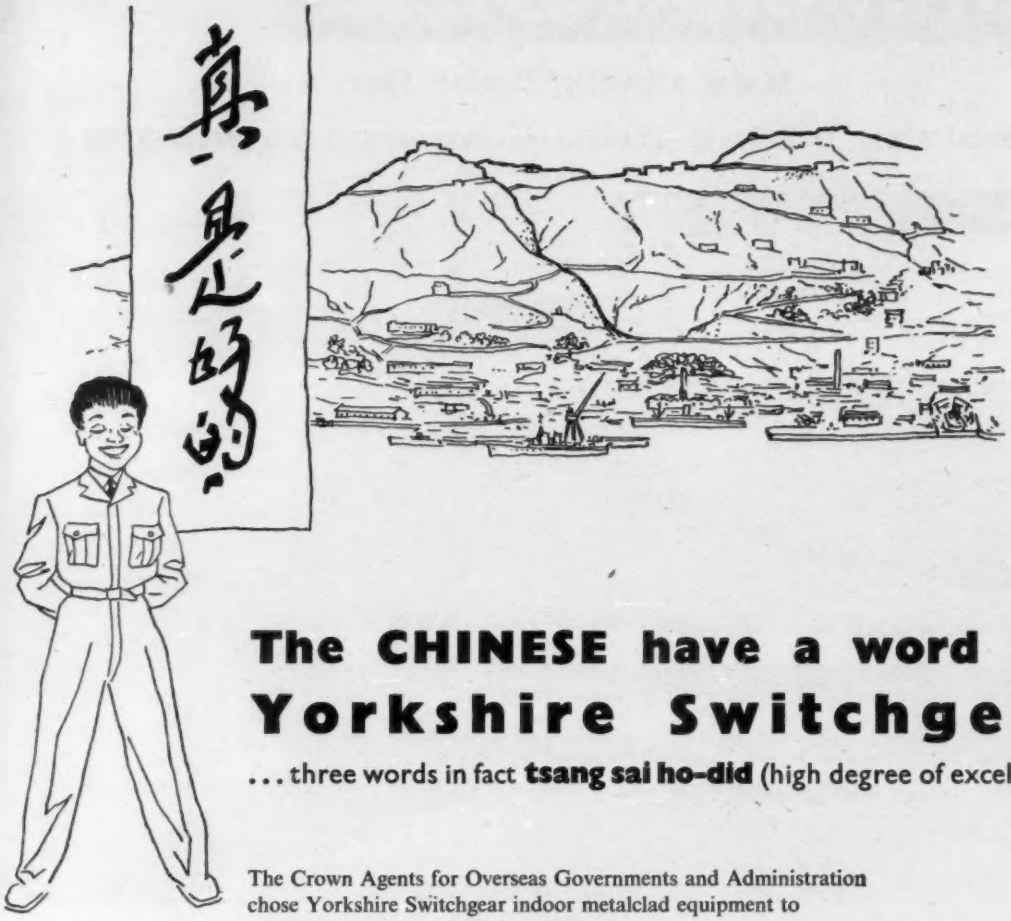

The CHINESE have a word for Yorkshire Switchgear

... three words in fact **tsang sai ho-did** (high degree of excellence)

The Crown Agents for Overseas Governments and Administration chose Yorkshire Switchgear indoor metalclad equipment to control the 6,600 volt supply to the new Hong-Kong Government Offices. The installation includes three and five panel-type IVIF-13 switchboards suitable for 150 MVA duty at the system voltage.

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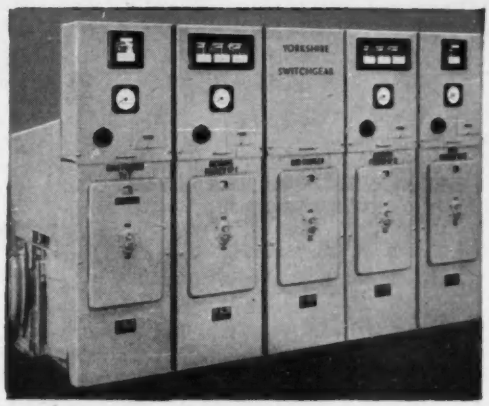
And so . . . Yorkshire Switchgear was chosen.



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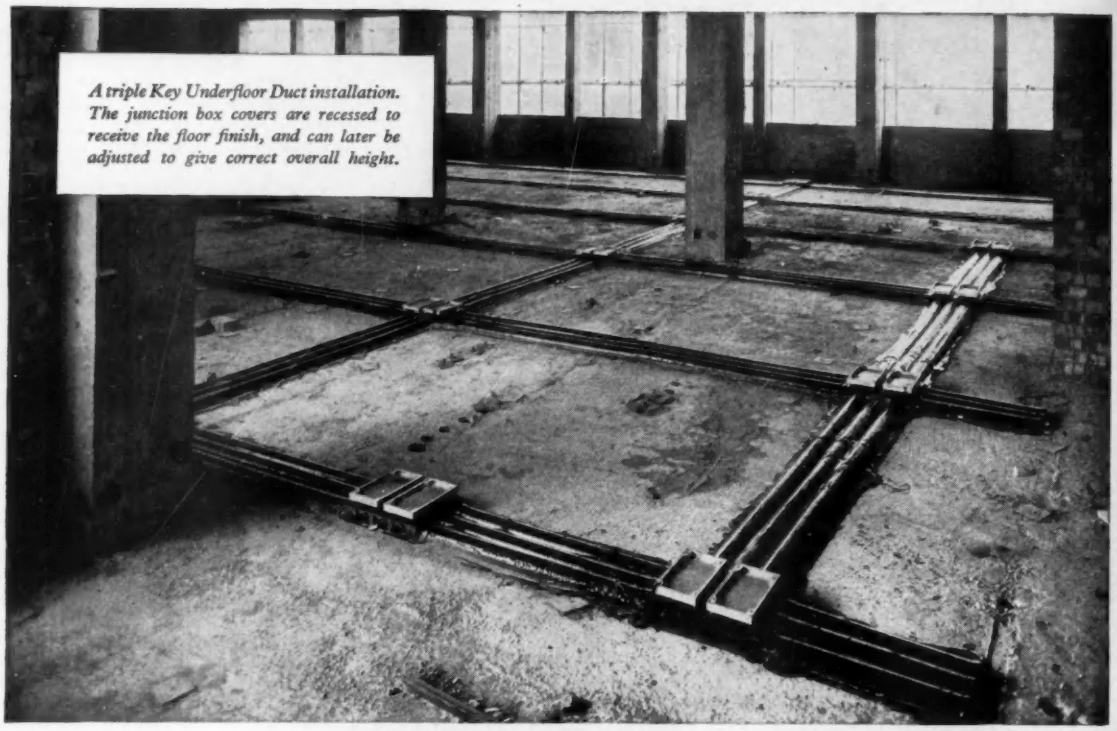

A triple Key Underfloor Duct installation. The junction box covers are recessed to receive the floor finish, and can later be adjusted to give correct overall height.

Electric power and telephone outlets can be installed and added as necessary when Key Fibre Underfloor Duct is used. On a materials plus labour basis the cost of installations is lower than any metal system. Because of their light weight and ease of cutting and fitting, Key ducts can be quickly laid. Since there is no necessity to pre-position outlets, the architect can install an underfloor duct scheme, and later fit outlets to suit the occupant's requirements. The fitting of these outlets is a quick and simple matter and the most complete range of fittings is available for lighting and telephone systems.

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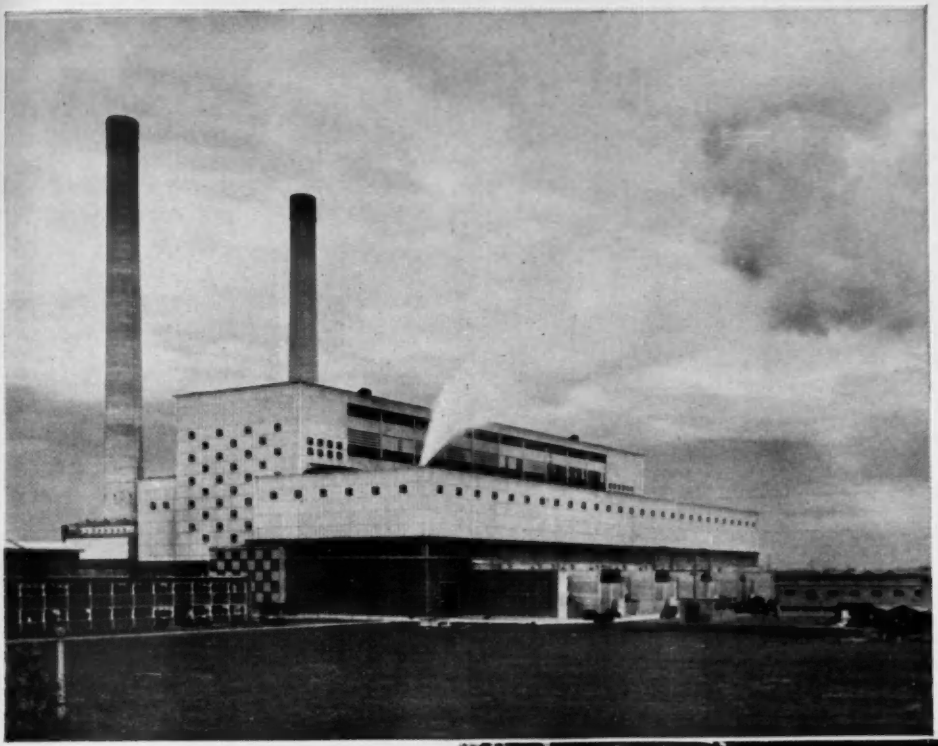
CASTLE DONINGTON



Castle Donington Power Station of the C.E.G.B., East Midlands Division.

Castle Donington Power Station was designed to house six 100 MW steam turbine-generators and their associated condensing plants and feed water heating and deaerating equipments, manufactured by Metropolitan-Vickers. The three units shown were the first 100 MW, 3,000 r.p.m. units to be operated in Great Britain. The turbines are of two-cylinder, close-coupled design, for operation with steam conditions at the turbine stop valve of 1500 psig, 1050°F. and exhausting to Metrovick condensers.

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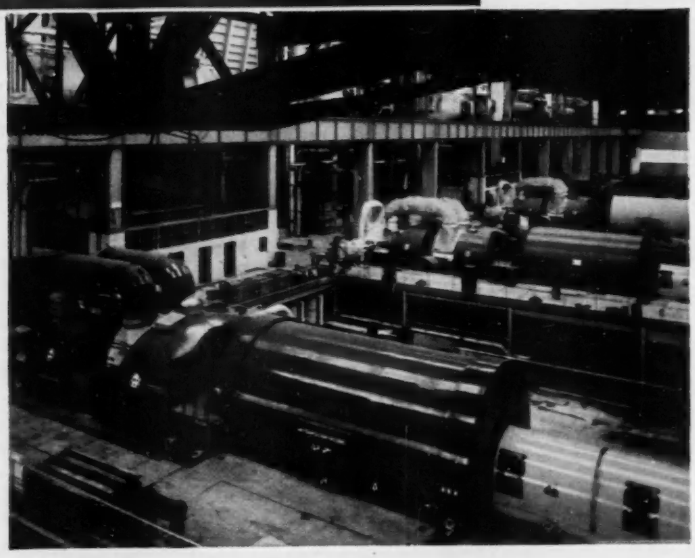
The generators are directly connected to the Metrovick main step up transformers.



View of Turbine Hall during construction of the first three sets. Of the six sets ordered, five are installed. The sixth set has completed its test at works and is being shipped to site.

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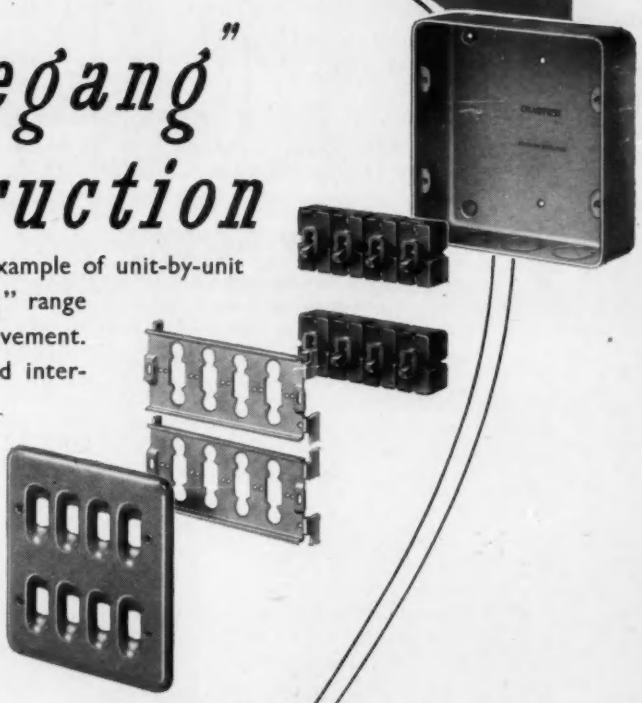
"Tubalux" fittings are illustrated in a special folder as well as in the general catalogue showing the complete range of Troughton & Young lighting fittings.

Architects: R. Mountford Pigott & Partners.

"Closegang" construction



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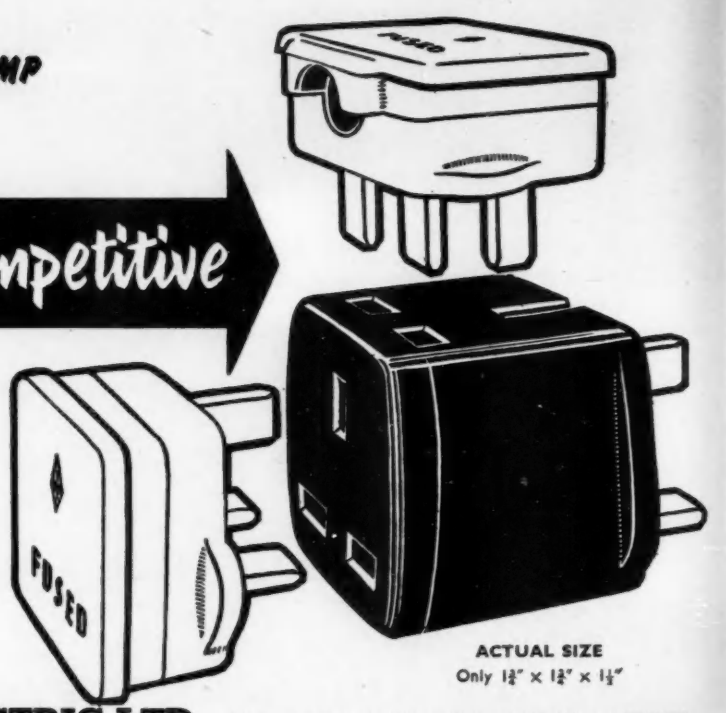

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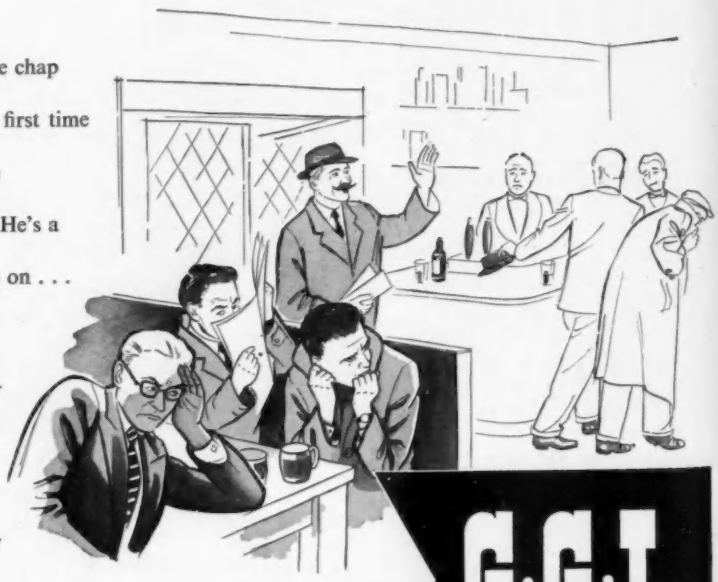

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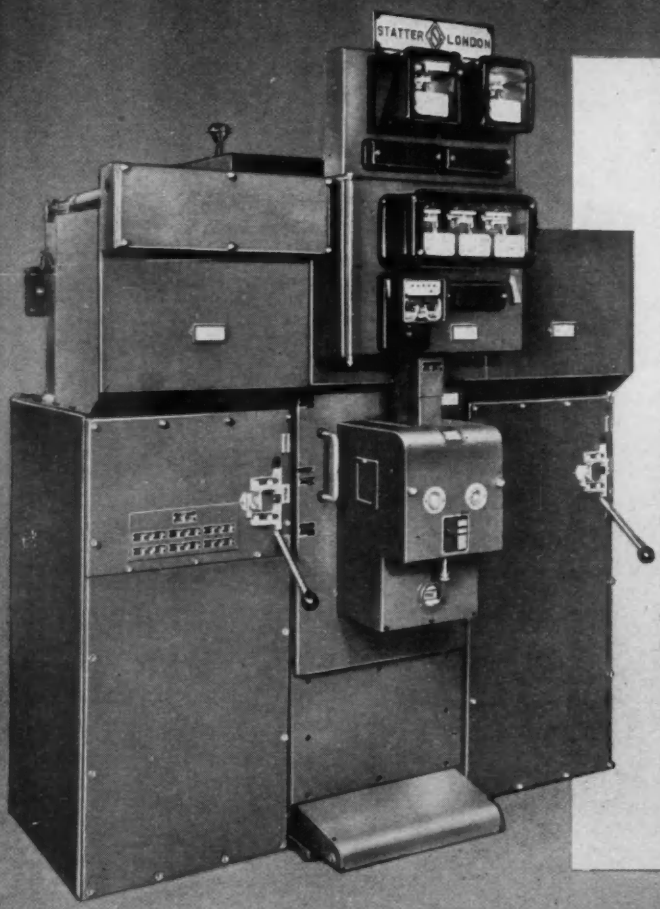

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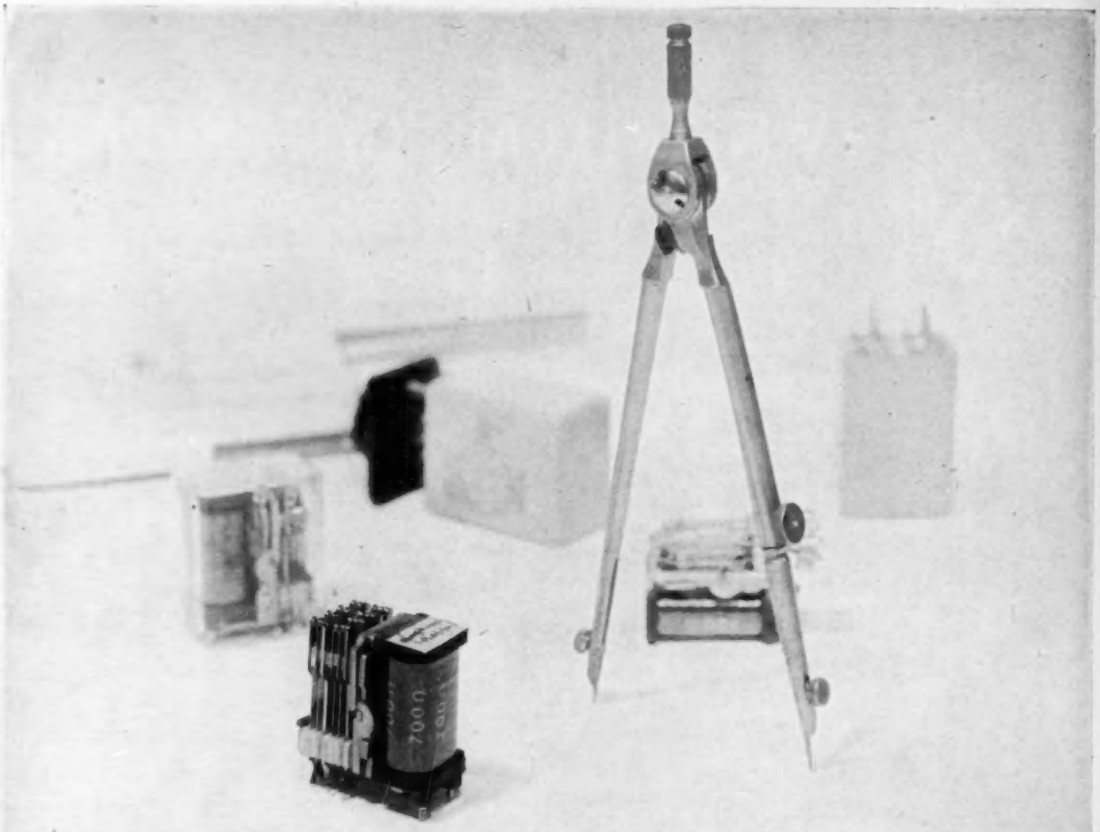

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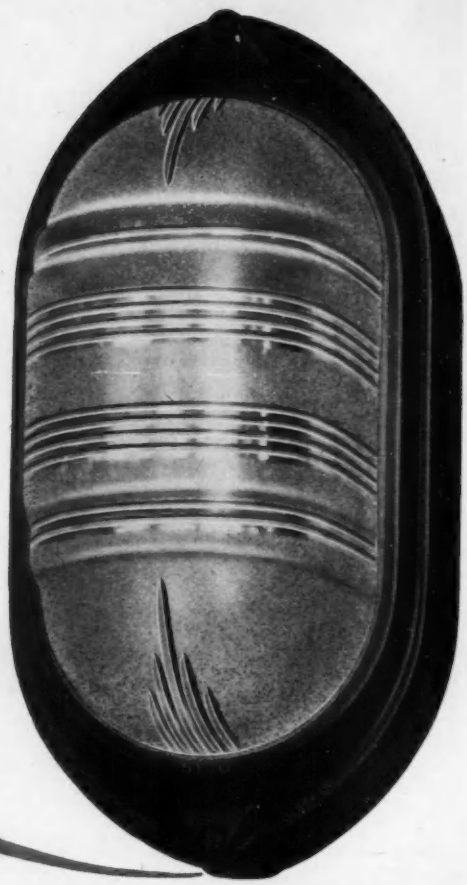

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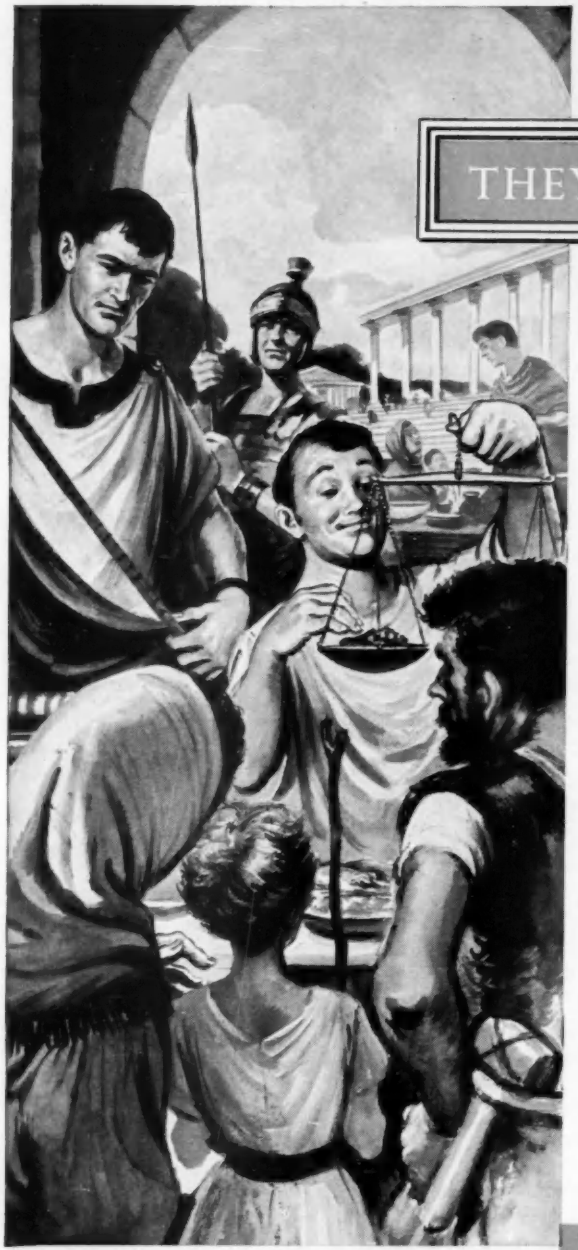

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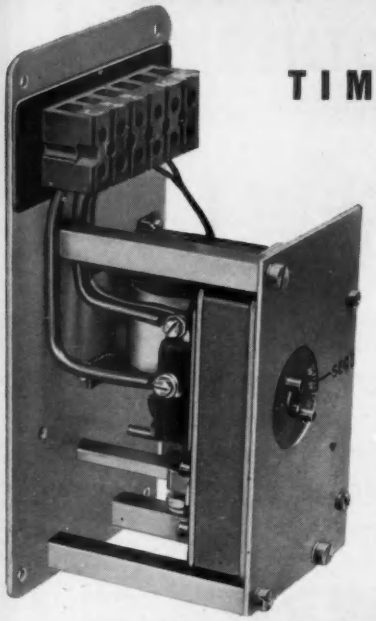

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Relays for standard voltages and times are available ex stock.

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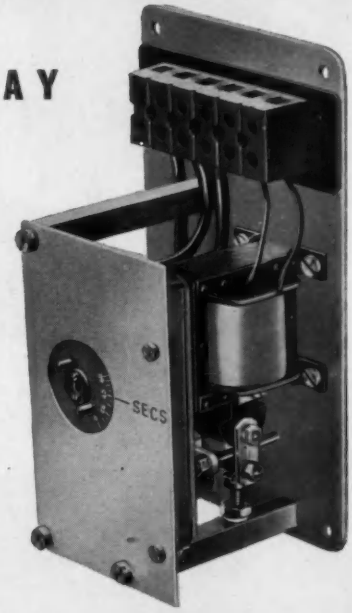
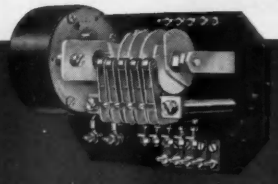
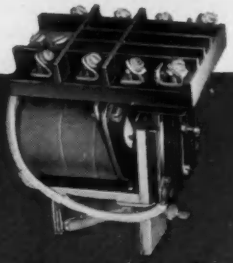


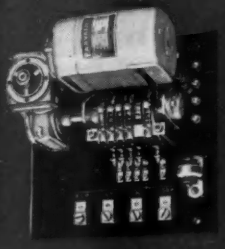
SOME EXAMPLES OF OTHER TYPES OF TIME DELAY RELAYS



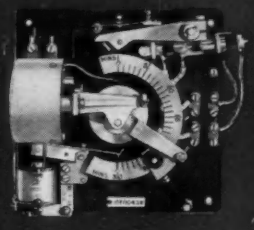
Cam Timer for A.C. Operation



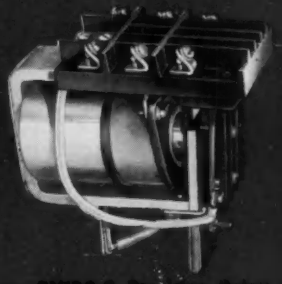
Type 8X222-2 Precision Time Delay Relay



Cam Timer for D.C. Operation



Synchronous Motor Driven Timer with Instantaneous Reset Feature



Type 8V120-2 Precision Relay with Time Delay [illegible]

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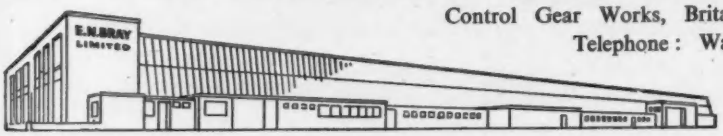

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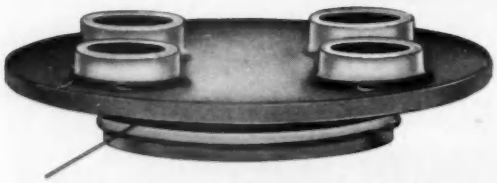

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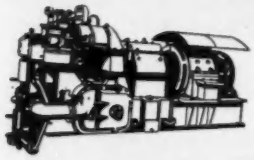

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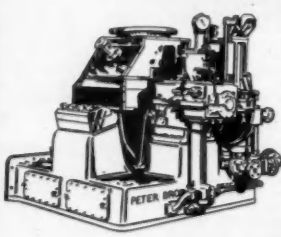

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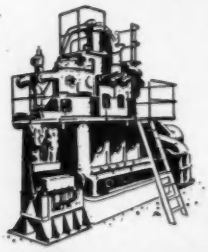

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Creda prices are right — because they're low. Creda heaters stand out as the best buy... SO THEY SELL!

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Creda heaters range from 750 W to 2 kW — from convectors to reflector fires. There's a Creda heater for everyone... SO THEY SELL!

...they all add up to your biggest-ever sales with

Creda heaters

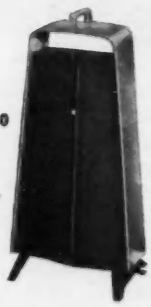
SIMPLEX ELECTRIC CO LTD
Creda Works Blythe Bridge Staffs
London Showrooms: Creda House Binney Street London W1

A GEC COMPANY

Creda California
3 grille designs 1.5 kW
£9.0.0 plus £1.19.6 p.t.

Creda Capri
1 kW £6.5.0 plus £1.7.5 p.t.

Creda Cubana
1 kW £4.15.0 plus £1.0.10 p.t.
2 kW £5.10.6 plus £1.4.3 p.t.

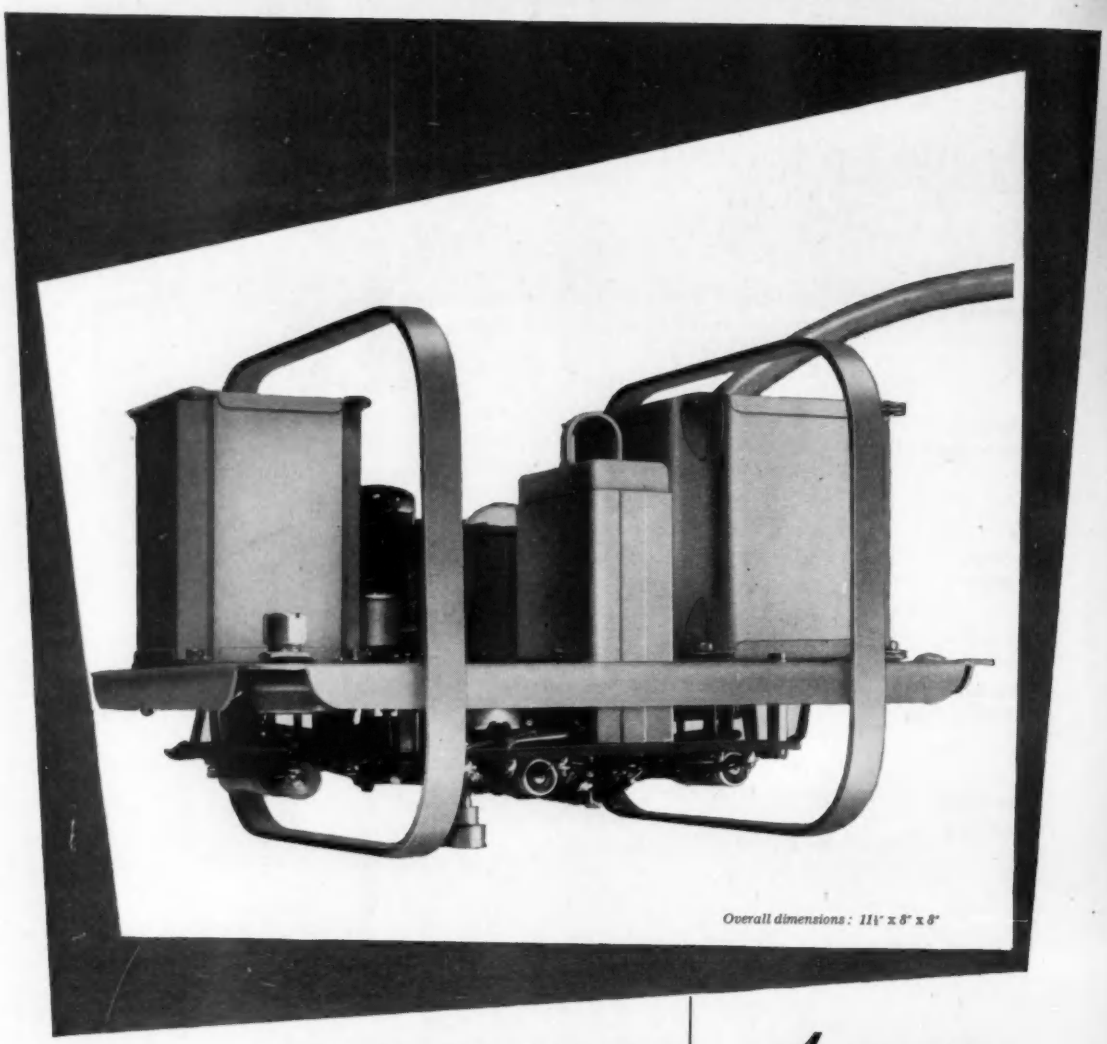


Creda Calypso
750 watts £3.8.10
plus 15/1d p.t.
2 kW £6.18.4
plus £1.10.4 p.t.

Voltage Ranges
200/220, 230/250 volts AC/DC
(2 kW Cubana and 2 kW Calypso AC only)

CO354 CC400

Synchronising AUTOMATICALLY



Overall dimensions: 11½" x 8" x 8"

The new Austinlite Synchronising Unit cuts out the need for complex and time-taking precautions when switching an A.C. generator into an already running A.C. system. The Unit detects voltages, phases and frequencies and, when these are all in step with the system, the generator is paralleled and can be safely switched in.

More than this, with auxiliary apparatus additional generators can be automatically started up, synchronised and connected with the system —and later disconnected—as the power demand fluctuates. The Austinlite Synchroniser can again be combined with other apparatus to form a load sharing device between two paralleled generators.

Simple in design, the Austinlite Synchroniser is self-contained, built on a small chassis suitable for back-of-panel mounting. Installation is an easy matter : little or no maintenance is needed. It can, if required, be used as a conversion unit with existing generating plant.

Let us give you a more detailed description of this unit.

Austinlite

ELECTRICAL EQUIPMENT

Tailor-made by

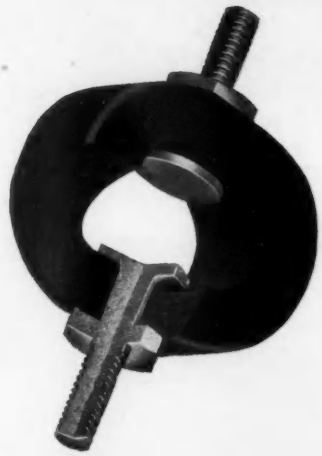
STONE-CHANCE LTD.

(makers of Sumo Pumps and Stone-Chance Lighthouses)

CRAWLEY, SUSSEX.

Photograph of the Viscount by courtesy of Messrs. Vickers-Armstrongs (Aircraft) Limited.

quietly doing a job —



One of the most versatile of Silentbloc anti-vibration mountings is the Ring-Stud type. This type was used for mounting the very sensitive relays in the generator power circuit positioned on the power panel under the cabin floor of the Vickers Viscount. The cut-away illustration shows the unique construction of the Silentbloc Ring-Stud type mounting which has the merit of not being dependent on bonding, the rubber and studs being mechanically locked. This is only one of hundreds of Silentbloc anti-vibration mountings. Whatever your vibration problem Silentbloc will have the answer.

SILENTBLOC

SILENTBLOC LIMITED, MANOR ROYAL, CRAWLEY, SUSSEX

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BRENTFORD GREEN SEAL

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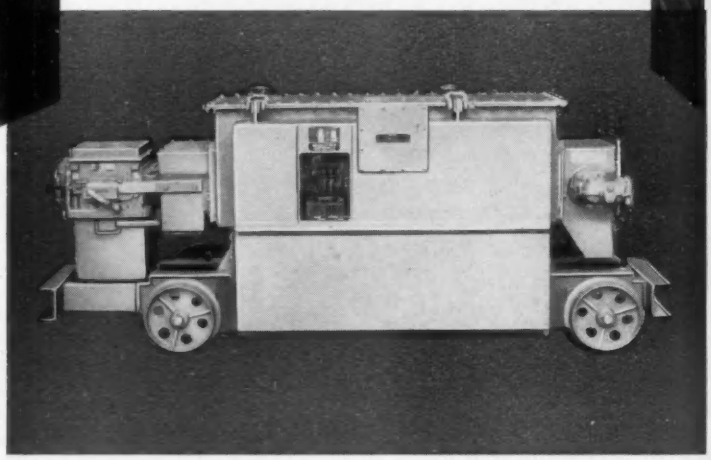
A **NEW** SAFETY MINING TRANSFORMER

- Insulated with Class H material.
- Transformer totally enclosed in a sealed tank filled with nitrogen.
- Voltage ratio 3150/525-420 volts, 150 kVA.
- Requires minimum maintenance.

SAFE • HIGH TEMPERATURE PERFORMANCE • FIREPROOF • DUSTPROOF



This is the first transformer of its kind in service with a Division of the **NATIONAL COAL BOARD**

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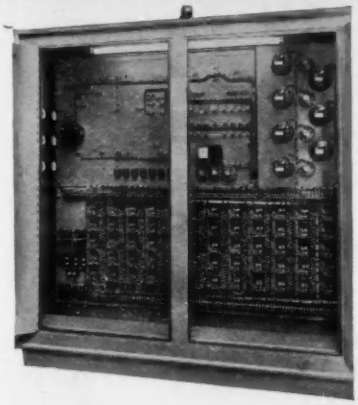

Illustration by courtesy of The Stirtevant Engineering Co. Ltd.

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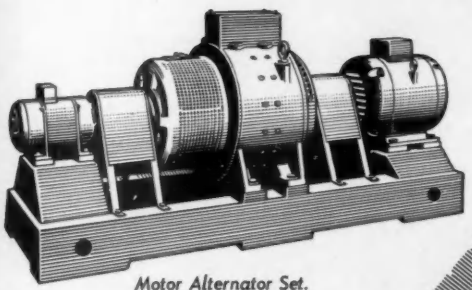
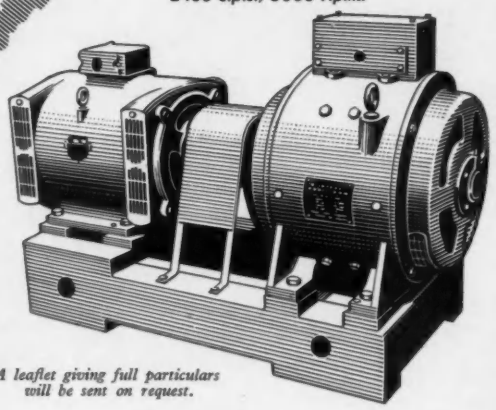
ELECTRICAL EQUIPMENT



Motor Alternator Set. 12 kVA, 400 c.p.s. single phase, 3,000 r.p.m. with exciter

High Frequency Motor Alternator Set 5 kVA, 115 volts, 1 phase, 2400 c.p.s., 3000 r.p.m.



A leaflet giving full particulars will be sent on request.

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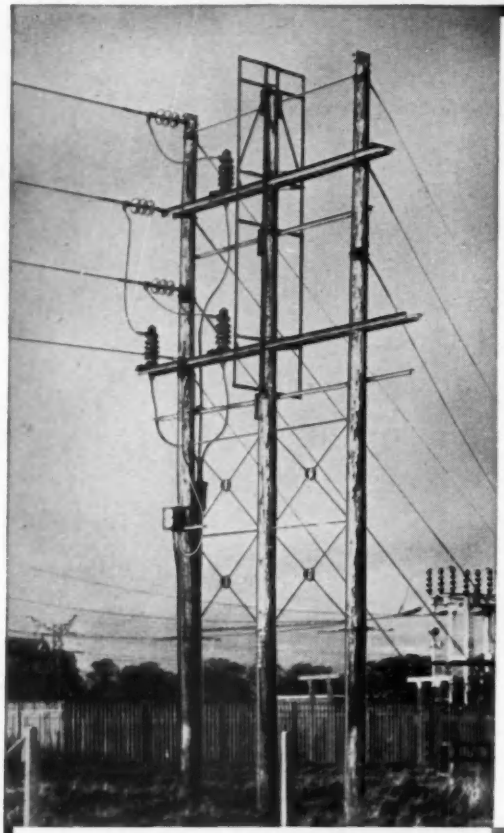
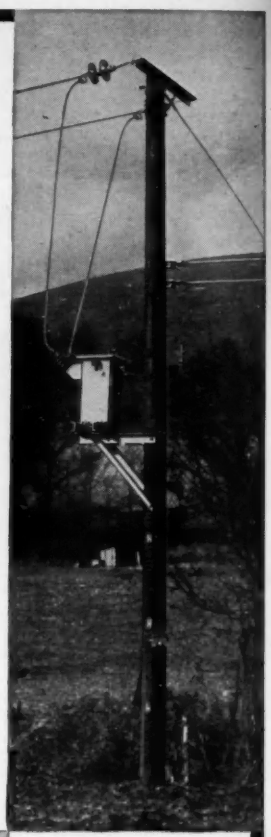


You can depend on it!

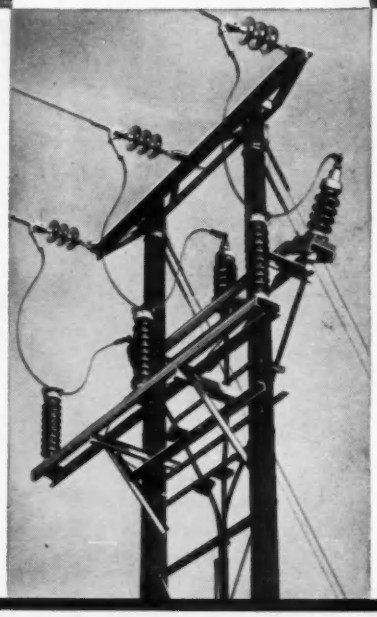
Overhead Transmission Line Equipment

made by

BAYLISS, JONES & BAYLISS LIMITED



Safe, efficient electrical transmission depends on the reliability and toughness of the galvanised forgings and steelwork that make up Transmission Line Equipment – the all-important items Bayliss, Jones & Bayliss have been manufacturing for over half a century and supplying to Electricity Authorities in all parts of the world.



The range of items manufactured includes:

INSULATOR PINS
LINE STRAPS
TIE STRAPS
DRIVE-IN STEPS
DETACHABLE POLE STEPS
STAY RODS
POLE CAPS
TRANSFORMER BRACKETS
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BJB

MS

SILICONES

serve the electrical industry

PAGE 1

Higher performance, fewer breakdowns with MS silicone insulation

Silicone-insulated dry-type transformers are safer!

Four 56 kVA Class H transformers incorporated in a Westinghouse rectifier equipment. This is part of a 12,000 kVA installation comprising 243 Class H transformers made by Transformers (Watford) Ltd. The installation supplies heavy current to electrolytic tinning lines at the Velindre Works of the Steel Company of Wales.

By taking full advantage of the new Class H and Class C insulation ratings, dry-type transformers can be made smaller and lighter in weight than O.N. or Class B units and are free from fire or explosion risks. They can be placed at load centres making shorter low-voltage cable runs possible. Class H and Class C dry-type transformers are easily maintained, dust, humidity and ventilation proving no problem.

Midland Silicones Ltd. manufacture the full range of silicone resins and elastomers used by transformer manufacturers in the construction of silicone-insulated dry-type units.

(Photograph by courtesy of Westinghouse Brake & Signal Co. Ltd.)

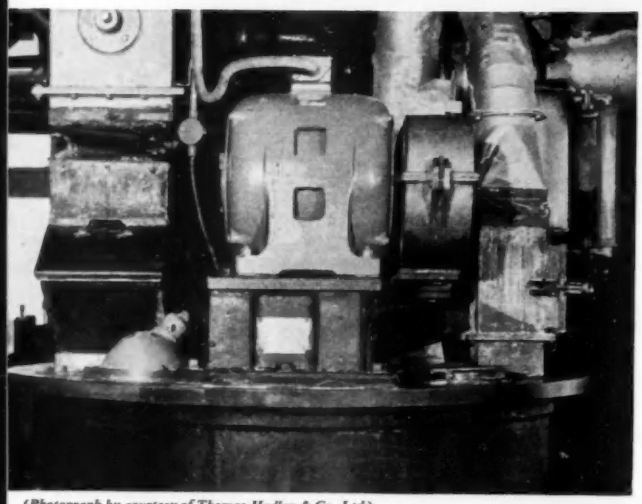
YDW/Ms 99

MIDLAND SILICONES LIMITED

PAGE 2

MS silicone motor rewind saves £400

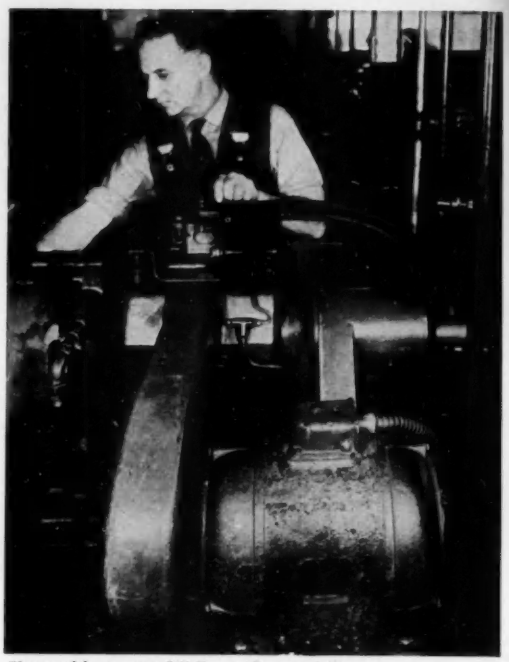
Thomas Hedley & Co. Ltd., at the company's West Thurrock factory, found that one of their motors working in a particularly wet position broke down at average intervals of six months. Rewinds were tried in Class A insulation (costing £30 each time) and in Class B insulation with extra varnish dips to give additional protection against moisture—both without success. Finally they tried a silicone rewind. This was nearly seven years ago and the motor has been operating since without failure, thus saving approximately £400 in rewind costs. In addition losses in production time due to motor failure have been eliminated.



(Photograph by courtesy of Thomas Hedley & Co. Ltd.)

MS Silicones strengthen the weak link in all forms of electrical equipment—its insulation. With silicone-insulated motors the risk of breakdown through insulation failure is very greatly reduced. Have your most troublesome motors rewound with silicone insulation.

MIDLAND SILICONES LIMITED



Photograph by courtesy of Hoffmann, Gloucester Ltd.)

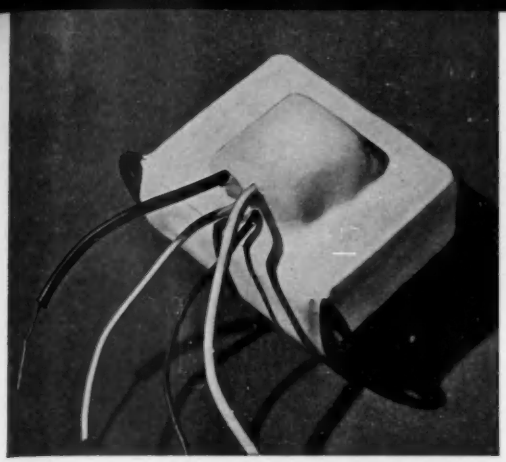
MS silicone-insulated motors withstand years of continual 'plugging'

The photograph shows a silicone-insulated motor operating at the Stonehouse Works of Hoffmann, Gloucester Ltd., who have kindly provided us with the following information. "We have a bank of 12 machines, each being driven by a 2 h.p. 1425 r.p.m. motor and as the motors burnt out they have been rewound with silicone insulation by British Electrical Repairs Ltd., and this has proved very satisfactory over the past 2 to 3 years.

These motors are working in unusual conditions, as the following description of their working cycle shows, and they stand up to the work very well indeed.

A complete operation takes 12 seconds then the machine is operated to reload which takes 2 seconds. To decelerate rapidly to the stop position for loading the operator presses the stop button followed by 'plugging' (pressing the reverse button). This is drastic treatment when continued all day and speaks well for the rewound motors."

This is a typical example of how MS silicone insulation increases the life and reliability of hard working motors . . . saves money by reducing the need for frequent rewinds and replacements.



New MS 'do-it-yourself' rubber for encapsulating electrical components

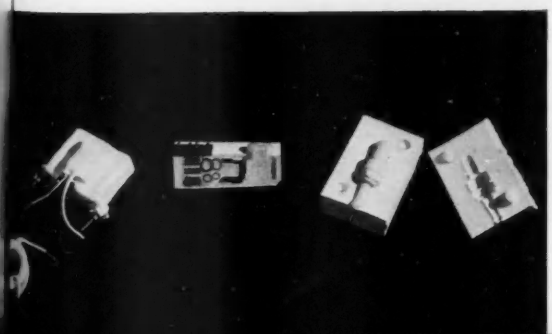
MS Cold-Curing silicone rubber needs no heat to cure—a simple technique enables it to be applied even by unskilled operators—the addition of a catalyst is all that is required to cure at room temperatures. The curing time may be varied from a few minutes to several hours according to the proportion of catalyst added. MS Cold-Curing rubber possesses the excellent dielectric properties, heat endurance and high thermal conductivity associated with silicone rubbers. The material retains its resilience at both high and low temperatures (−50°C to +300°C) and has excellent resistance to weathering and oxidation.

MS Cold-Curing silicone rubber opens up new fields for designers. It can be used to fill voids around lead wires of coils and motors, for impregnating coils and for other sealing or potting applications.

MS Cold-Curing silicone rubber is also used for making flexible moulds in which epoxide resins are cast.

TYPICAL PROPERTIES OF MS COLD-CURING SILICONE RUBBER

Tensile strength lb./sq. in.	450
Electric strength, on 10 mil sample, ¼-in. electrodes in oil at 20°C instantaneous value, V/mil	400
Permittivity, at 1 Mc/s	3.20
Volume Resistivity, ohm.cm, 500 Volts D.C.	1.5×10^{14}
Power Factor, at 1 Mc/s	0.006

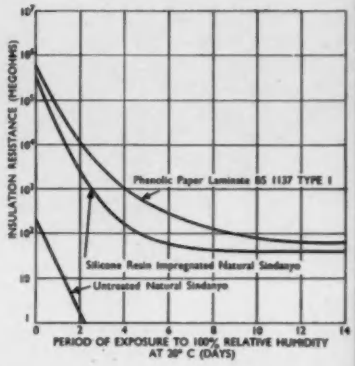


'Natural Sindanyo'* improved by MS resin impregnation

The Steel Company of Wales Ltd., have, for some time, used a resin bonded wood material for panels for mounting contactor control gear. Several fires occurred in some hot and dirty locations when surface contamination of the panels resulted in tracking and breakdown. This Company have now decided to use Silicone Resin Impregnated Asbestos Board in place of the wood material in these locations and, at present, carry out the impregnation process themselves using MS Silicone Resins.

THE EFFECT OF HUMIDITY ON THE INSULATION RESISTANCE OF NATURAL SINDANYO BOARD

Test methods based on B.S. 1137 appendix H


INSULATION RESISTANCE (MEGOHMS)
Phenolic Paper Laminate BS 1137 TYPE I
Silicone Resin Impregnated Natural Sindanyo
Untreated Natural Sindanyo
PERIOD OF EXPOSURE TO 100% RELATIVE HUMIDITY AT 20° C (DAYS)

'Natural Sindanyo' is widely used as a non-inflammable insulant but is limited in many applications by its high moisture absorption. The improvement in the insulation resistance characteristic under high humidity is shown in the graph with the performance of a well established type of phenolic paper laminate included for comparison.

Silicone Resin Impregnated Sindanyo has excellent thermal endurance and arc resistance. Suggested applications include arc chutes, components for dry-type transformers and domestic heating appliances as a substitute for paper/phenolic board where flame resistance or high anti-tracking properties are required.

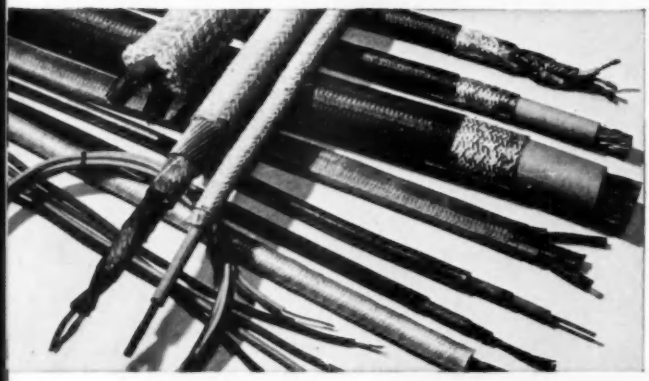
** Cement bonded asbestos board made by Turners Asbestos Co. Ltd.*

MIDLAND SILICONES LIMITED

PAGE 4

Navy specifies silicone insulated cables

'The British Admiralty has decided to use silicone insulated cables for all ship wiring purposes in future H.M. Ships. Such cables will have a much longer life than the types now used in the more onerous operational conditions which will be experienced in future ships and will have fire resistant properties which should confer substantial operational advantages.' *Admiralty statement.*



Silastomer* silicone rubber insulated cables will give long term service at temperatures up to 200°C. They show excellent resistance to oxidation and the effects of corona. Even more important, in some applications is the fact that they can operate during and after fire since Silastomer leaves an insulating silica residue after decomposition.

Silastomer insulated wires and cables are used in aircraft wiring systems, ignition and electronic circuits, domestic and other electrical appliances and for general industrial wiring applications where high temperatures occur.

*'Silastomer' is a registered trademark of Midland Silicones Ltd.

(Photograph by courtesy of Joseph Lucas Ltd.)

Every service engineer should keep a tube of MS 4 insulating compound in his kit

This grease-like material does not harden or melt over the temperature range −50°C to +200°C. It is anti-tracking, corona-resisting, chemically inert and highly water-repellent. It lubricates, protects and seals disconnectable plugs and sockets, cable harnesses, ignition circuits and terminals. It extends the life of cable covering and flexible bushes and grommets. When lightly smeared on insulators it maintains high insulation resistance under wet conditions.

Technical service facilities

Silicones are used in all forms of electrical equipment as insulation, heat transfer media, lubricants, structural components or seals. Our Electrical Engineers and Technical Service Department are ready to help you in the choice of the silicone product best suited for your application.

For further information and names of suppliers who can offer you MS silicone insulating materials write to:

MS

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(associated with Albright & Wilson Ltd. and Dow Corning Corporation)

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first *in British Silicones*

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The Merseyside and North Wales Electricity Board's 33 kV substation at Ruabon, equipped with 'ENGLISH ELECTRIC' 750 MVA single tank outdoor oil circuit-breakers, type OKM4.

'ENGLISH ELECTRIC' switchgear, similar to that illustrated, has been installed or is on order for Grid and Distribution Substations in England, Wales and Scotland, as well as in Australia, Burma, Canada, Hong Kong, India, Iraq, Jugoslavia, Pakistan, Peru and Turkey.

'ENGLISH ELECTRIC'
switchgear

THE ENGLISH ELECTRIC COMPANY LIMITED, MARCONI HOUSE, STRAND, LONDON, W.C.2
Switchgear Department, Stafford

WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

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TYPE HF-OJ A.S.T.A. CERTIFIED.

the logical choice

BRUSH

extensible

OUTDOOR RING-MAIN UNIT

incorporating Switch-Fuse Unit with fuses in air

- *Air-insulated fuses.*
- *A.S.T.A. certified at 6.6 kV and 11 kV up to 250 M.V.A.*
- *Fully interlocked.*
- *Speed of operation independent of operator.*
- *Facilities for cable testing.*

The Brush extensible HF-OJ outdoor unit is intended for ring-main application and embodies two oil-switches and a high voltage switch-fuse which provides an economical solution for the control and protection of tee-off feeders and transformers.

Full information covering the component equipment of the Unit is contained in our Publications 41016/14/17.

BRUSH —*for quality*

BRUSH ELECTRICAL ENGINEERING CO · LTD

Loughborough - England *Member of the Hawker Siddeley Group*

S.2.

FRIDAY
31 OCTOBER
1958

ELECTRICAL REVIEW

Managing Editor: HUGH S. POCOCK, M.I.E.E. *General Editor:* J. H. COSENS *Technical Editor:* P. W. TUCKER, M.I.E.E.

In This Issue

Housing Estate Supplies 801
In connection with the provision of electricity supplies to housing estates, Bermondsey Borough Council has suggested that the existing working formula should be made flexible to take account of floor warming installations

An Architect's Approach to Floor Warming 803
The author considers that electric floor warming systems are a basic advance in building productivity. They enable savings to be made in capital costs and the architect is able to adopt a completely open plan

Silicone Compound Treated Insulators 808
The performance of insulators when exposed to industrial and other contaminated atmospheres is discussed. Tests have shown that an application of a grease-like silicone compound greatly reduces leakage and flashover

Overseas Electrical Trade 825
British electrical exports in September showed a further fall and the month's total of £14·9 million was the lowest recorded this year

Performance of Telephone Systems 827
The difficulty of measuring the transmission performance of speech links is explained. Practical assessment methods are used, rating one link as so many units better or worse than another

Car Body Painting 831
A new £3 million painting plant has recently been completed by Morris Motors. The plant contains two separate lines on which 52 bodies per hour can be processed. Each line incorporates a high degree of automatic control and the total electrical load is approximately 3 MW

✧ ✧ ✧ ✧

"Comet 4" Power System 807
A.S.E.E. Presidential Address 810
Technical Papers 811
I.E.E. Sub-Centre Chairmen 812
Views on the News 813
Personal and Social 814
Industry and the House 818
Letters to the Editor 819
Industrial News 821
Generation and Development 836
New Electrical Equipment 838
Financial Section 840
Next Week's Events 843
Contract Information 845
REGIONAL GUIDE TO ELECTRICAL CONTRACTORS 101
CLASSIFIED ADVERTISEMENTS 105
INDEX TO ADVERTISERS 116

VOLUME 163 NUMBER 18 ✧ *Eighty-Sixth Year of Publication* ✧ FRIDAY PRICE 1s 6d

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PRINTED CIRCUIT!

ONE-HAND OPERATION!

THE NEW METROHM

represents a tremendous technical advance in insulation and continuity testers. It combines ease of operation and high technical quality with a sturdy robust design and construction which will ensure very many years of trouble-free service.

Here are some of the METROHM *features:*

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3. Easy one-hand operation.
4. Clear-reading protected dial.
5. Moulded front panel set in a fibre-glass case.
6. 500-volt insulation and continuity tests combined in a single instrument.
7. Practically ripple-free—only 0.1% ripple.
8. Long battery-life.
9. Good design and quantity production combine to keep the price low.

PRICE: *complete with detachable polythene front cover, leather sling strap and 5′ test leads fitted with crocodile prod clips* .... **£21.12.0d.**

250 and 100 volt models also available.

For fuller technical description and applications write for Sheet 242 A.

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ELECTRICAL REVIEW

31 October 1958 Vol. 163 No. 18 Established 1872

Housing Estate Supplies

ONE of the problems which arose after the nationalisation of the electricity supply industry was how to meet the rising cost of supply extensions to serve the large number of new housing estates then being developed. Previously, where many of the electricity undertakings were owned by local authorities, the question of whether or not the potential revenue was sufficient to make the supply economic was a matter for the Councils themselves, but with the transfer of the undertakings a new situation was created. Faced in a number of cases with applications for supplies to estates where electricity was to be used for little else than lighting, the Area Boards quite rightly asked the authorities concerned to contribute towards the cost in order that an unfair burden should not be placed on the general body of electricity consumers. Many Councils however objected, contending that it was the Boards' duty to provide the supplies at their own cost.

This long-standing dispute was finally settled in 1956 when a working formula was agreed upon between the Boards and local authorities in England and Wales. It provided that, except in cases of abnormal expense and difficulty, no contribution would be required towards the cost of taking supplies to estates if the electrical installations were of a specified minimum standard and tenants were given freedom to choose electrical appliances for cooking, water heating, etc.

This formula seems to have operated fairly satisfactorily during the past two years but its terms have lately been criticised by the Bermondsey Borough Council in connection with one of its redevelopment schemes. Because the Council's proposals depart from the standard laid down in the formula, it has been asked by the London Electricity Board to make a substantial contribution towards the cost of service lines and connections. The Council, which has not been charged in the past, reports that electrical under-floor heating is to be installed and other electrical equipment (not covered by the formula) will include drying cabinets and airing cupboard heaters. It is felt that even though gas water heating is specified (no mention is made of which type of cooking appliance is to be used), the electrical services should be enough to make up for any loss of revenue to the Board. The Council complains of lack of flexibility in the formula and suggests that negotiations should be begun for its revision, particularly in view of the development of electrical floor warming since the agreement was negotiated.

We find it hard to understand why, having decided on off-peak electric space heating, the Council should install gas water heaters and it may be that the Board, in adhering strictly to the terms of the formula, hopes that the Council will reconsider

this decision. At the same time it has to be admitted that the Council's point on the need for some flexibility in the application of the formula is a legitimate one and it will be interesting to learn the outcome of the Metropolitan Boroughs' Standing Joint Committee's discussions on the matter. For our part, we hope the time is not far off when, with the general development of the domestic load and the public demand for more adequate installations, the need for any such formula will no longer exist.

NO TAX ON FLOOR-WARMING

Rumours have been current recently that the Customs and Excise authorities were contemplating the imposition of purchase tax on floor-warming installations. It seemed to us very unlikely that they would wish to become involved in the highly complicated business of defining exactly what a floor-warming installation was and how much of it could be subjected to tax. Every such installation has to be (or should be) the subject of special design and is in fact a constructional job. If the tax were placed merely on the cable and control equipment it would surely have to cover all those classes of cable and equipment whatever their use. The floor construction itself could hardly be taxable without the investigation and assessment of each individual installation. Moreover there is no better case for taxing electric floor-warming than for taxing other central heating methods.

So Customs and Excise have wisely decided that floor-warming installations are not a proper subject for the tax. They do say, however, that anything like a "Do it Yourself" kit devised for the purpose would become liable, presumably as a "heating appliance." But such an idea is not really practicable.

NUCLEAR FUEL PRODUCTION

Several factors have influenced the design of the Stanat-Mann combination mill, described in this issue, which will be used for rolling and forming metals employed in fuel elements for nuclear reactors. Since the quantities involved in research and development work and initial production orders are likely to be small, the capital cost of plant had to be kept as low as possible, and a single machine has therefore been developed to roll the material in a variety of configurations in place of the several mills needed with conventional practice.

Plutonium is one of the metals which will be treated by the mill and it has to be handled with extreme care. It is a highly toxic alpha-emitting material readily oxidised in air, and some of the non-adherent oxides, if inhaled, may enter the bone marrow through the blood stream and cause bone cancer or leukemia. Furthermore there is danger from spontaneous combustion, and to overcome these difficulties the material is handled in a glove box filled with an inert atmosphere of argon gas.

To completely house the mill in a glove box would introduce electrical problems, however, because argon atoms are readily ionised and cause insulation breakdown. The glove box is therefore confined to the roller section only, the motors and other electrical equipment being mounted externally in air and driving through shafts with gastight seals where they enter the box.

POWER AND PLUTONIUM

When the mishap to the Windscale (Cumberland) No. 1 reactor occurred about a year ago it was decided to close down No. 2 pile in order to inspect a reactor in a similar condition to the one in which the accident took place. It has not been restarted and last week it was announced by the United Kingdom Atomic Energy Authority that it had decided not to restart it. The cost of doing so would be in the region of £500,000 which would make the plutonium produced extremely expensive. It was emphasised that the cessation of plutonium production at Windscale would not mean "redundancy" of staff because the chemical processing programme there was increasing.

There will be no shortage of plutonium because Calder Hall is producing substantial quantities and the Chapelcross reactors will be put into operation next year. No mention was made by the Authority of the Government's decision last June that plutonium for military purposes should be produced at the Hinkley Point and subsequent nuclear power stations but it is possible that the loss of Windscale had something to do with it.

HANDLING LARGE PRODUCTS

During the course of the year we are privileged to visit over 100 factories. For a general classification it is useful to divide factories into the types of production system used and physical size of the "end product." Probably the majority of the factories in this country produce a small item by some form of mass production process. However, many of the larger items of equipment used in the electricity supply industry are, of course, produced in very small numbers and there are not many examples in any industry of quite large items being produced by elaborate mass production processes. One exception is the manufacture of motor vehicles and in this issue we publish a description of a car body painting plant at Morris Motors.

One of the more interesting features of this type of factory is the extensive conveyor system required to transfer the body between operations. Because of the length of the production line the conveyors have to be divided into sections. These conveyor sections must be operated in synchronism, and the control is based not only on speed but also, mainly, on position. The arrangements represent another good example of the adaptability of electrical control methods to a complex system.

HAIR DRYERS

The electric hair dryer is an acceptable Christmas gift. Next week's issue will contain an illustrated survey of the models available, with tabulated details of weight, element loading, motor rating, finish, special features and price. A number of models are now being made in pastel shades

An Architect's Approach to Floor Warming

INFLUENCE ON THE DESIGN AND COSTS OF BUILDING

By R. BADEN HELLARD, Dip.Arch., A.R.I.B.A., F.I.Arb.

The use of electric floor warming enables savings to be made in the capital cost of buildings and frees the architect both technically and aesthetically. The effect of floor finish on the efficiency of the system is examined and the author suggests that the additional cost of installing a withdrawable system is seldom justified. In conclusion emphasis is placed on the importance of properly assessing costs before comparing different heating systems

To see the growing use of electric storage heating in its proper perspective, I think we must first examine the architectural background against which installations have developed. There are two major influences. The first is the ever-present and increasing need to reduce capital costs. Were this all that was necessary there is no doubt in my mind that electric storage heating systems would be the universal means of heating, for, properly assessed and costed, no other system of heating, not even the simplest open fire, can be as economical in initial costs. But capital costs are not the only criteria, for a system that involved crippling running costs would have short-lived success.

The second major influence is the increasing adoption of open planning in most types of buildings. Whether this has arisen from an ability to produce larger structural spans, thereby freeing the floor and walls of the building from structural duties, or whether the structural advances were stimulated by the desire for a large uninterrupted floor space, I do not know—but certainly with the comfort conditions also required by present-day living standards, the return to large open spaces in our buildings has demanded the development of systems of heating which will give an even warmth over large areas from a relatively low-temperature heating source.

Electric floor warming systems are, I consider, an absolutely basic advance in building productivity. The heating method is simple and uses a " standard " product, in use by the mile for other purposes. The control equipment and the design technique are both simple. With its use the complicated pipes, control cocks, radiators, pumps, gauges, boilers and automatic feeding apparatus inseparable from hot water heating systems disappear, and with them also the need for costly and time consuming " design " services by the heating and ventilating engineer. This is not to say that we have all that can be desired in anticipatory control equipment for floor warming, but this can surely never be so complex as the conglomeration of fittings to be found in the heating engineer's catalogue!

It is not easy to arrive at the right price for new techniques in their early days, nor is it easy to compare the price with that of other systems for some of the savings appear in other parts of the building and in the work of other trades. A proper assessment is, therefore, very important and later in this article I will set out how this should be done to present the cost factors realistically.

Although at present prices electricity costs far more per useful therm than oil and solid fuel, this is not the only factor that should be considered by individual consumers, whatever their scale. It is likely, for example, that the steady rise in the cost of coal will continue, and since the supply of oil is susceptible to a breakdown in transport or normal diplomatic or trading relations, we should view with reserve the widespread use of oil heating systems. In any case, if it appears particularly advantageous to burn one type of fuel this is surely best done in power stations. Except as regards price, the advantages which oil has over solid fuel, such as easier transport, storage and automatic control, and absence of dust and ashes, apply with much more validity to electricity. With the development of nuclear power, electricity may not only fall in price relatively to other fuels, but the need to obtain a high load factor should further encourage the Electricity Boards to offer favourable off-peak tariffs for storage heating systems.

Are these systems then equally suitable to all types of buildings? Quite definitely the answer is " No!" and for two reasons. First, since the characteristic of the heating cycle is the maintenance of a steady temperature throughout the twenty-four hours with a long build-up period and a correspondingly long cooling-off period, the greatest efficiency and benefit will naturally be obtained in buildings that are occupied continuously. Where a building is occupied for a shorter period or only intermittently, such as a church, the benefit will be less, although the availability of a special tariff or other advantages such as automatic operation may still make electric storage heating an economic proposition.

The second basic factor which will determine the efficiency of the system is the thermal storage capacity of the building. A very light prefabricated structure may not have sufficient mass for this purpose, except in its ground floor, where the 4 to 6in of concrete oversite will be adequate enough in ordinary circumstances with most normal solid floor finishes. When a building has concrete intermediary floors and brick or concrete walls, the conditions are ideal, for these " masses " will store the heat emitted by the heat source until the room temperature falls to a point where the heat will flow back into the

air from the structure. The need for insulation, both around the perimeter of the floor containing the heat source and in the building itself, to prevent the heat from wasting to the outside, cannot be too greatly emphasised, for every pound spent here will save at least four or five over the life of the building.

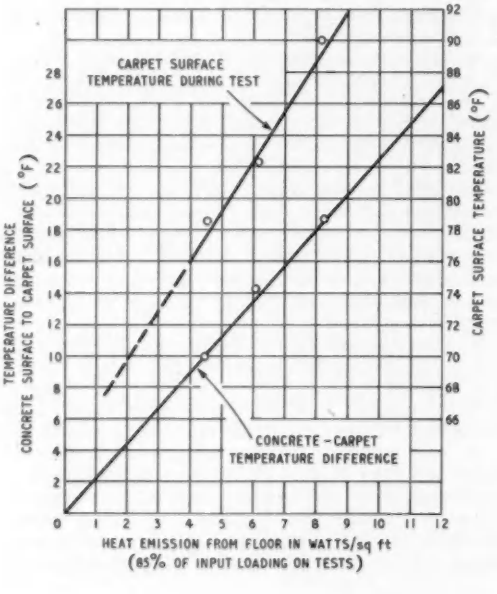
Amenity and Æsthetics

Whatever the size of the building, the use of electric storage heating will enable the architect to adopt a completely open plan, and free him technically and æsthetically. He will no longer be faced with the difficulty of siting fuel stores, and the need for providing for their maintenance, or of accommodating chimneys and flues. In blocks of flats, in particular, these aspects are among the architects' and local authorities' greatest problems, and they also provide most scope for reducing costs.

Where electric floor warming is employed the internal plan of flats and houses may be influenced by the effect that the position of large and bulky furniture can have upon the performance of the heating system. Beds, for example, act as an obstacle to the radiant heat from the floor and the bed surface itself tends to remain cold; and where a room is heavily furnished with soft upholstered items, the floor will have a considerably reduced performance. This should also be borne in mind when planning large built-in units under which the heating coil will run.

The personal factors which can lead to the selection of electric floor warming for a domestic installation are: absolutely no attention is required by the system; there are no radiators to harbour dirt and dust; no floor space is lost for heating equipment; there is absolute cleanliness in operation, with consequent freshness and possibly financial savings in decoration; and, above all, the cost of installation is low. Against these five advantages, due consideration must be given to the provision of a focus point in living rooms. Much of the argument on the theme that the open fire is essential to the British way of life results from the psychological need for a focus,

Fig. 1.—Rise of concrete surface temperature beneath carpet laid on heated floor


CARPET SURFACE TEMPERATURE DURING TEST
CONCRETE - CARPET TEMPERATURE DIFFERENCE
TEMPERATURE DIFFERENCE CONCRETE SURFACE TO CARPET SURFACE (°F)
CARPET SURFACE TEMPERATURE (°F)
HEAT EMISSION FROM FLOOR IN WATTS/sq ft (85% OF INPUT LOADING ON TESTS)

but once this is realised, it is a fairly simple matter for the architect to provide some compensating alternative. It could, for example, be a television set or a pleasant view from a window. Some clients will not require a positive focus, but will welcome the opportunity of arranging their own, with perhaps a circular table with changing displays of flowers or plants.

It is reasonable, I think, that the costs of features included purely for æsthetic or amenity reasons, as a result of using floor warming, should be included in the total cost of the installation, and set against the cost of any treatment provided by way of decoration to, say, an open fire. Only in this way can the client be given a true assessment of the value to him of different heating systems.

Comfort Conditions

The obvious and most important difference between a storage heating system and any other system is the lack of controllability—or more correctly—delay in controllability, and the deeper the heating cables are laid in the screed the less sensitive the system is to control. On the other hand, the response is automatic and does not depend on the action or decision of a stoker or other official. Also floor warming provides a consistency of temperature in normal conditions (a consistency which is maintained even with the sudden changes in outside temperature) which has to be experienced to be really appreciated. If there is a sudden increase in temperature then opening the windows, as with other systems, is a natural method of adjustment, which in practice does not seem to waste much electricity. When there is a sudden fall in temperature the difference is felt less severely than it is in other systems due, I think, to the radiant nature of the heat source.

In considering actual temperatures it should also be remembered that in cold weather anyone moving between different heating conditions does so at a brisker rate, and acts as a "human compensator." If, alternatively, a continuously sedentary occupation is being followed, such as knitting or reading, an additional small high-temperature radiant heater is an economic and adequate way of temporarily producing additional local comfort conditions. I would therefore always recommend with under-floor systems the provision of an adequate number of socket-outlets so that local heat sources can be used if occasionally required. There is no doubt in my mind that the comfort experienced with floor warming properly installed in well-insulated buildings is all that can be desired.

Floor Finishes and Screeding

In considering the type of floor covering to be used it must be remembered that any form of insulation above the heat source—such as cork, wood or carpet—will tend to restrict the upward flow of the heat and therefore to send it downwards with consequent loss around the sides of the building. It can also lead to a reduction in the radiant emissivity of the floor area, and therefore if carpets are used they should be kept small, and be placed near the centre of the room—leaving at least a foot between the edge of the carpet and the edge of the building. This is particularly important where an installation has been carried out leaving a perimeter strip without cables. The graph in Fig. 1 shows the effect on heat emission of floors covered with carpets.

I have also found that floor warming tends to lead to sticky floors. This, I think, is due to the fact that if anything solid is spilt on the warm floor and not wiped away quickly it will melt and then dry more quickly

than on a normal floor and thus adhere to the surface.

Details of some typical floor finishes in relation to floor warming are given in Table 1. A material for which details of resistance and surface temperature are not included, but would seem in many ways to be an ideal product for use with floor warming, is "Blue Hawk" flooring, now being mass-produced by the British Plaster Board (Mfg.), Ltd. This is a tile consisting of a veneer of high quality hardwood 3 mm thick, resin-bonded to a sand and u/f backing. It thus not only combines low resistance to upward heat flow with a high thermal capacity in the backing, which itself improves the storage, but also provides an attractive wood finish.

The screeding which secures the cables is obviously an important part of the construction, and fracturing of cables has been known to occur where a concrete screed has shrunk and cracked on drying. This risk can be reduced by using as dry a mix as possible for the part of the screed which contains the cables, and a 1 : 4 cement/sand ratio is perhaps the most workable mix in this condition.

Recently, however, a material known as "Synthanite" has been developed which would seem to be ideal for screeding with under-floor cables. "Synthanite" is a by-product of hydrofluoric acid and is a synthetic anhydrite. It weighs 140 lb/cu ft, has a flexural strength of 957 lb/sq in and a compressive strength of 4,020 lb/sq in with a conductivity of 4·92. Its most valuable property in connection with under-floor heating systems is that it can be laid in large beds of up to 600 sq yd, without fear of shrinking and the problems of cracking, to which I have referred. It also seems to have no detrimental effect on the cable coverings, and my firm is now using this material as a standard specification with non-withdrawable under-floor heating.

To reduce the normal downward heat loss from buildings a number of firms have recently advocated the use of lightweight aggregate for oversite floor slabs. But anything that restricts downward heat flow would seem to restrict upward heat flow once the heat has penetrated beneath the building, and a lightweight aggregate would also seem to reduce the storage capacity, and possibly even increase the sideways heat loss. Comparative tests in similar instances using lightweight and normal screeds will be necessary, however, before this point can be finally proved.

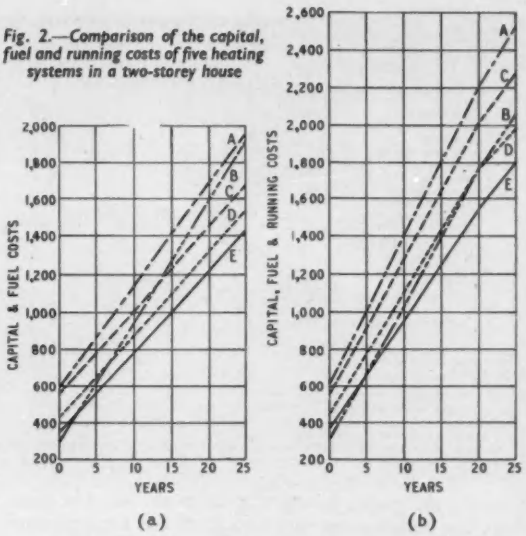
The perimeter insulation cannot be too highly emphasised in my opinion. If this can be taken down to 2ft it is a very good standard to achieve. It should be something which retains its insulation qualities when wet or damp, such as "Ozonite" and "Terlite" or, of course, some of the new expanded polystyrenes would be an equally good choice.

Choice of System

When consideration is given to the type of floor warming system to be used, in very few instances, if at all, will the extra cost of fitting a withdrawable system be found to be justified. There is virtually no risk of the heating cables burning out after occupation and if, therefore, the cables are tested frequently during the installation and no damage occurs, the only possibility is that they may be fractured by the shrinkage of the screed on drying.

But what if there is a failure? With both withdrawable and embedded systems the cost of locating and replacing is much the same, but with the embedded system, in addition, it will be necessary to take up the floor on each side of the failure and re-screed and re-lay the floor. The cost of this operation could be something

Fig. 2.—Comparison of the capital, fuel and running costs of five heating systems in a two-storey house



A. Conventional hot water radiator system using solid fuel boiler. B. Electric floor warming using solidly embedded copper sheathed cable. C. Complete house warming system with blown and ducted warm air. D. Similar system to "C" but using only a single central duct. E. Solid fuel convector fire in living room with built-in under-floor ducts and convection ducts to other rooms, with solid fuel boiler providing hot water and a certain amount of convection. (Note: All systems have electric immersion heater for summer hot water)

of the order of £25 to £30 per fault as against £5 to £10 with the withdrawable system. A larger installation does not seem to increase the risk of failure, and although in such an installation the cost of repairing a fault may be considerable it will certainly not be as great as the additional cost that would have been incurred in installing a withdrawable system in the first place.

Even the smallest system will have a loading of 5 or 6 kW and the cost of a withdrawable system will be between £5 and £10 extra for each kilowatt installed. With a housing scheme or large building the additional cost per kilowatt may be only small, but this will be multiplied 50 or 500 times. The initial extra cost, plus the extra loan interest, will be more than the cost of dealing with even a complete failure in one or two dwellings, or sections of the building, several years after the installation. I would therefore suggest that the additional costs of withdrawable systems could be saved and the small risk taken.

In making a true comparison of the cost of different heating systems it is essential to assess the effect of each one on the total capital cost of a particular building. The capital cost of any heating system is made up of three parts:—

1. The equipment used to provide the heat and, if necessary, to transfer it to the point of requirement.
2. The direct builders' work involved.
3. Indirect work, such as excavations for a boiler house, trimming joists and providing flashings on chimneys, which would normally be charged to its own respective trade.

It is difficult to decide when this detailed analysis should be made because the choice of the system may well influence the plan form of the building, and it is inevitable that when carrying out the sketch designs one thinks and plans in terms of the heating system which may ultimately be used. Nevertheless, it should be possible to take a sketch plan and work out the details of alternative heating methods and their costs. For

TABLE I.—TYPICAL FLOOR FINISHES IN RELATION TO FLOOR HEATING

Type	Thermal conductivity k (approx.)	Thickness	Bedding	Thermal resistance R (approx.)	Max. surface temp. deg F	Underside temp. deg F
A. Wood block	1·0	$\frac{3}{4}$in	Mastic	0·9	80	110
B. Articulated wood block	1·0	$\frac{3}{4}$in	Mastic	0·6	80	100
C. Wood strip	1·0	$\frac{1}{2}$in	Mastic or adhesive	0·9	80	110
D. Wood chip blocks	1·0	$\frac{1}{2}$in	Adhesive/mastic	0·7	80	105
E. Cork tiles	0·5–0·54	$\frac{1}{4}$in	Mastic or adhesive	0·6	80–90	95–110
F. Composition blocks	2·2	$\frac{1}{2}$in	$\frac{1}{2}$in mortar	0·3	95–120	110–140
G. Tiles and paving:						
1. Burnt clay and quarries	5·8–6·0	$\frac{1}{2}$–$\frac{3}{4}$in	Sep. layer or mortar on sep. layer	0·09–0·1	85–90	95
2. Concrete	6·0–7·0	$\frac{1}{2}$–$\frac{3}{4}$in	Mastic or mortar	0·1–0·12	90	95
3. Terrazzo	6·0	$\frac{3}{4}$in	Mortar	0·1	85	90
H. Thermoplastic tiles	3·5	$\frac{1}{8}$in	Mastic	0·05–0·07	80	82–85
J. Rock asphalt tiles	8·0	1in	Screed	0·12	80	85
K. In-situ composition:						
1. Terrazzo	6·0	$\frac{1}{2}$–1$\frac{1}{2}$in	Screed	0·08–0·2	80	85
2. Granolithic	6·0	$\frac{1}{2}$–1$\frac{1}{2}$in	Screed	0·08–0·2	80	85
3. Latex or PVA	3·0–3·5	$\frac{1}{2}$–1in	Screed	0·07–0·12	80–95	85–100
4. Bitumen, asphalt or "Pitchmastic"	6·3–10·0	$\frac{1}{2}$–1$\frac{1}{2}$in	Screed or any solid base	0·07–0·12	75–85	80–90
L. Linoleum	1·1–1·3	$\frac{1}{8}$in	Mastic	0·12–0·24	80–85	83–90
M. Plastic sheeting and tiles	2·8	2·5 mm	Adhesive	0·06–0·09	85–120	90–130
O. Rubber	1·9–2·0	$\frac{1}{8}$in	Mastic	0·13	80	85

Note: The use of any particular floor finish for stated conditions must depend upon the experience of the flooring specialist concerned. Details should comply with B.S. Codes of Practice. The thermal conductivity, k, is the heat transmitted, B.T.U. per hr per sq ft for one degree F difference of temperature in 1in thickness of the material. The thermal resistance, R, does not include the bedding layer, and is the temperature difference across the finish for each B.T.U. per hr per sq ft of floor surface. The temperatures are the maxima normally used by heating engineers in the design of embedded panel systems. Surface temperatures higher than 80 deg F refer to border heating in conjunction with special floor construction.

example, the graphs in Fig. 2 illustrate the effect of these three cost elements on both the capital and running costs of five different systems in a two-storey house.

Details were drawn for each system and a bill of quantities prepared for the work. Assessed in this way, remarkable capital costs emerged and confirmed what I have said earlier, that electric floor warming was easily the cheapest, even when quite lavish allowances were made for extra focus fittings and additional equipment in the kitchen in lieu of the boiler. Having considered the capital costs of these systems, the next consideration must be running expenses, and these break down into fuel consumption costs and other running costs. The latter roughly correspond to maintenance costs, and their effect is shown in Fig. 2 (b).

In a larger scheme the detailed build-up of these costs will alter, and in some buildings alternative schemes—probably using oil fuel—may show up better at the moment, but it is significant that two large local authorities have decided recently that all their new tall blocks of flats shall be heated by electric storage systems.

Savings in Costs

Among the savings obtained by using electric floor warming in large schemes are the cost of the boiler house, fuel store, chimneys and flues, and the space that they would occupy can be devoted to living accommodation. There will also be savings in the cost of access roads and of an attendant or stoker. Recent studies carried out by the Building Research Station have shown that it is worth while spending £10,000 extra in capital costs to save the work of one man who to-day would probably cost £500 a year.

As compared with individual solid-fuel systems there will be no need to provide special surfacing of lifts, stairways and areas around fuel stores as a protection against damage when fuel is delivered, and the cost of refuse disposal will also be less. These savings in capital costs could make it possible to provide extra thermal insulation within the capital budget, and the savings in interest on the lower capital required will still further reduce the running costs of the electric system.

I have therefore been encouraged to believe that electric storage heating, particularly underfloor systems, has a most valuable part to play in developing the amenity and æsthetic quality of many of our buildings, and I believe that in both the short and the long term, it will prove economic to the consumer.

Once the heating system has been chosen the architect must be able to give the necessary operational instructions to the contractor so that he in turn can draw up his programme of work. Economy in building is increasingly dependent on the close integration of separate operations by different trades and although the laying of floor-warming cables is a relatively simple matter it takes place near the end of a job when the timing of various operations will be carefully assessed and penalties for non-completion may be at issue. It is therefore most important for manufacturers of floor-warming equipment to provide the architect with the facts he needs in a concise and standard form. This means that manufacturers' literature should be informative and technical (but not too much so) and should be produced in accordance with the recommendations as to size laid down in B.S. 1311:1958.

It may be that the decision to employ electric floor warming involves running a cost risk, but I believe we must take such calculated risks if the building industry is not to continue to lag behind other British industries, or behind progress of building abroad. Rapid developments in the field of nuclear energy lead one to believe that electrical energy will be offered to the community at greatly reduced costs in a very few years. If this is so then the figures quoted here will offer an even greater advantage in the years to come to those building owners with electric storage heating systems.

Electrical Barriers Against Sharks

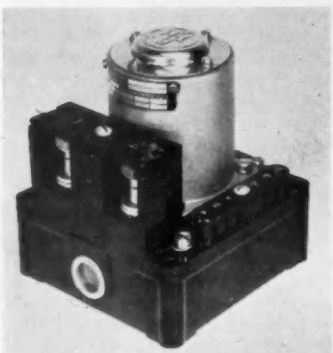
Experiments with electrical barriers to ward off sharks are to be carried out in Natal. The barriers will be tested first near Durban and, if successful, they will then be used instead of the present shark nets at holiday resorts along the whole of the Natal coast. The president of the Council for Scientific and Industrial Research, Dr. S. M. Naude, said in Pretoria recently that a research programme had been drawn up by the Council's anti-shark committee. The purpose of the programme, he said, was to provide a barrier which the sharks would find impenetrable but not lethal. Cables would be laid parallel with the beach to send out electrical impulses which would form an electrical field. Dr. J. A. Lochner would be in charge of the experiments; he would be assisted by Prof. J. L. B. Smith, an ichthyologist, and Mr. J. Simpson, of the Natal Marine Biological Association. Once the Council was satisfied that it had developed an effective electrical repellent, bathers would be "invited to convince themselves that the method is safe and keeps sharks out of protected areas."

"COMET 4" POWER SYSTEM

The De Havilland "Comet 4" powered by four Rolls-Royce Avon turbo-jets

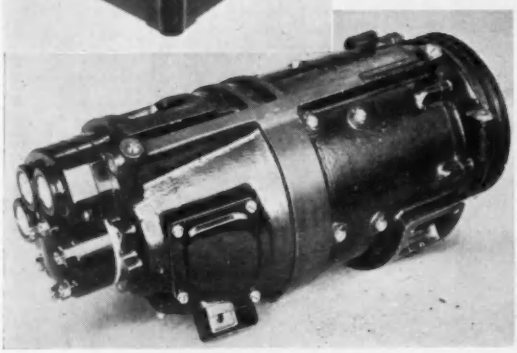
THE electrical power system of the De Havilland *Comet 4* utilises a rectified variable-frequency a.c. system. The main system is operated at 28 V d.c. and by using this voltage it has been possible to use equipment which has been fully developed to a high degree of reliability and thoroughly proved over the years. The modern constant frequency a.c. system which was in evidence at this year's Farnborough Air Show has not been used.

Power is generated by four 14 kVA alternators, one mounted on each engine. These alternators were designed and manufactured by the British Thomson-Houston Co., Ltd., in close collaboration with the De Havilland and Rolls Royce companies, and are so arranged that both bearings are lubricated by oil fed under pressure from the main engine oil supply. Cooling air is also taken from the main engine compressor, and although this air is hotter than the normal outside air, it is easier to maintain relatively constant cooling air conditions at any altitude or aircraft speed. The alternators deliver power over a speed range of 3,000 to 10,000 r.p.m.



Left: B.T.H. 400 A single-pole single-throw heavy duty contactor with remote operation

Below: B.T.H. 14 kVA 28 V three-phase alternator



A limited amount of the alternator output is used as variable-frequency constant-voltage a.c. for certain special loads on the aircraft, such as windscreen de-icing and de-misting, but the major portion of the generated power is fed to rectifiers and supplied as direct current to the system.

The four main power channels, each capable of delivering 350 A at system voltage, are connected in parallel on the d.c. side and the main busbar is divided into two circuits. Loads are so distributed in the system that it is possible to operate the aircraft satisfactorily from either circuit; thus all essential services are fed by a fully-duplicated power supply. A standby battery supply is also provided.

In addition to the main power generating equipment, there are 160 automatic circuit-breakers of ratings up to 35 A to control a wide diversity of circuits including radio equipment, cooling fan motors, lighting, etc.; over 30 heavy-duty contactors and circuit-breakers with ratings up to 400 A for general power distribution; a large quantity of small relays, some with sensitivities of the order of a few milliamperes, to provide fault protection to the system and its components; and a considerable number of d.c. and a.c. motors varying from 4 h.p. down to $\frac{1}{40}$ h.p. for operating the many essential mechanisms and services.

Classified Bibliography

A 264-page bibliography, "The Effect of Technological Progress on Education," prepared by the Hazleton Memorial Library of the Institution of Production Engineers, has recently been published. It has been compiled from British sources in 1945-57 and is available from the Publications Department of the Institution at 10, Chesterfield Street, London, W.1, price 2s 6d (3s 6d by post). The bibliography, which is not comprehensive, is intended to be a guide to the development of technical education during the period covered and it should also serve as a summary of opinion on the subject.

SILICONE COMPOUND TREATED INSULATORS

Reducing Leakage and Flashover in Contaminated Atmospheres

Laboratory tests and full-scale trials show that an application of a grease-like silicone compound greatly reduces leakage and flashover on insulators working in contaminated atmospheres. A film of silicone material on the insulator surface causes the water which condenses or falls on to it to separate into droplets, preventing the formation of a continuous moisture film and maintaining a high surface resistivity

By
D. J. DOWLING,
B.Sc.(Eng.), Graduate I.E.E.*

THE alternative solutions to the problem of maintaining electrical insulators in an efficient condition when exposed to industrial and natural deposits are either to reduce the contamination, which is not always practicable, or to counteract the effects of the deposits. It has been shown that silicone coatings on insulators are advantageous in the latter case. A film of silicone material on the insulator surface will cause water which condenses or falls on to it, to separate into individual droplets and it prevents the formation of a continuous moisture film across the surface. High surface resistivity is therefore maintained.

Silicone compounds of a grease-like nature have proved to be the most effective in use.[1] The seemingly obvious disadvantage of such a coating, that of remaining grease-like during operation, has not proved to be a drawback in practice. The coating has a tacky surface and accelerates initial dirt collection, but it has been found that the effectiveness of the silicone compound is not diminished.

Tests in America

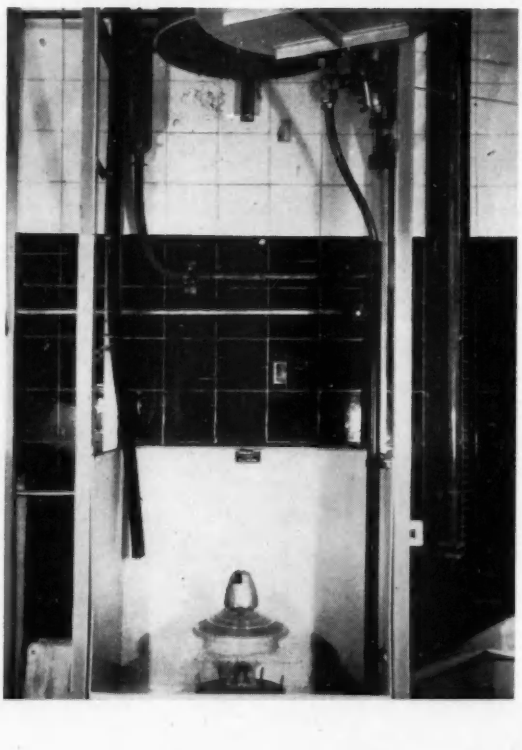
This was verified in results obtained by an American insulator company[2, 3] when a number of high-voltage insulators, some untreated and some coated with various materials, were subjected to industrial contamination. The treatments given to the insulators included organic waxes and greases, asphalt solution, silicone fluids and compounds, but the most effective treatment proved to be a coating of silicone compound. The insulators were tested at the outdoor high-voltage testing laboratory of the Ohio Brass Company and were subjected to industrial and road dust deposits while energised at normal line voltage of 44 kV to earth. The surges of leakage current (normally those exceeding 50 mA) were recorded in the instrument room of the laboratory.

During the two years over which the tests were conducted, no leakage current surges of the magnitude of 50 mA were detected on the insulators coated with silicone compound, yet 79 such surges were recorded on an adjacent untreated insulator. It was found that there was a considerable build-up of dirt on the treated insulator, but this did not have any effect on the insulator performance. This is contrary to most expectations, but when one considers the problem more closely, there appears to be a reasonable explanation of the test results.

The silicone compounds used are composed of a silicone fluid and an inorganic filler. A characteristic of silicone fluids is their low surface tension and it is thought that when dirt collects on the surface, there is a slight migration of the silicone fluid from the compound so that each particle of dust is individually protected with a water-repellent coating of silicone fluid.

Silicone Compound MS4 has been used by the British Insulated Callender's Construction Co., Ltd., in this type of application with considerable success. On a three-phase 33 kV line from Aden to Al Kod in the Aden Protectorate, pin insulators having a leakage path of 37in,

Insulator under test in Bundesmann apparatus



* Midland Silicones, Ltd.

British Standard rating 110, working voltage 50 kV, were installed instead of insulators with a leakage path of 20in, B.S. rating 70, which are normally supplied for 33 kV lines.

The reason for this choice lay in the fact that the transmission line, which is 30 miles long, is situated fairly near the sea for almost the whole of the route, and while the annual rainfall is very small, sand and dust storms are quite frequent during the day and the danger of salt and sand contamination on the insulators is very real.

The line is protected at the sending end with fast blowing explosion-type fusegear. It was energised in February, 1956, and shortly afterwards it was found that the fuses commenced blowing at night. Examination showed that, due to the high humidity at night, the salt deposits on the insulators became conductive, resulting in tracking and ultimate insulation failure between phases. Analysis of the contaminants from the polluted insulators showed that the deposits contained 14 per cent soluble matter composed mainly of sodium, magnesium, potassium and calcium chlorides. It was found that thorough washing and cleaning of the insulators retained line insulation for three or four weeks only, after which the blowing of fuses commenced once again.

Method of Treatment

In June and July, 1956, all the insulators on the line were sprayed with a solution of Silicone Compound MS4 in carbon tetrachloride, the units having been thoroughly cleaned beforehand. This is considered to be the most economic method of applying silicone compound, since the solvent will evaporate and leave an even film of the compound on the insulator. In April, 1957, most of the insulators were retreated as a precautionary measure, leaving several control insulators with their original coatings. No failure due to pollution has been reported on any insulator since July, 1956.

These results showed that a silicone compound coating on the insulators will maintain good surface resistivity under natural contamination plus high humidity conditions, but whether such a coating would remain after continuous heavy rain was another matter. To answer this question Pilkington Brothers, Ltd., carried out a series of rain spray tests on "Armourlight" toughened glass insulators, some untreated and the remainder coated with Silicone Compound MS4. Leakage measurements were made with 30 kV applied—the maximum voltage available during the tests. The artificial rain spray consisted of a series of nozzles having a 0·002in diameter orifice, and delivered a spray with a precipitation rate of about 1·5in per hour. Initially, leakage current measurements were made for the dry and wet condition of the insulator string. A strong salt-water solution was then sprayed on to the insulators and the leakage meaurements repeated.

The insulator string was then sprayed with the artificial rain for eight hours a day during the tests, and the leakage current measured at regular intervals. Half-way through the tests, and again at the end, the insulators were sprayed with the strong salt-water solution and the leakage current measurements were repeated. The results given in Table 1 show the improvement obtained when using a coating of silicone compound.

Similar tests, carried out by Midland Silicones, Ltd., to determine the effect of heavier rain, showed similar results. Glass insulators were used in these tests, and the rain spray was applied to the MS4 coated insulator in a Bundesmann test apparatus, which is commonly used in the textile industry to simulate rain. Rain spray fell from a height of 5ft on to the insulator at

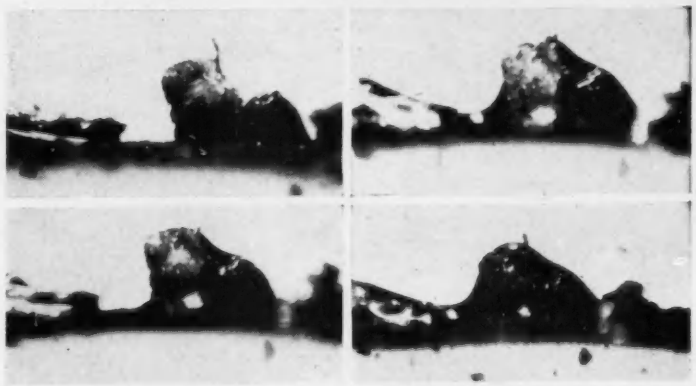
Close-up of silicone compound treated insulator showing separation of water into droplets

TABLE 1.—Leakage current tests at 30 kV on glass insulators Type BSF.10.5½ supplied by Pilkington Brothers, Ltd.

Condition of Insulators	Silicone Compound Coated Insulators	Untreated Insulators
Dry	0·025 mA	0·05 mA
Sprayed with artificial rain	0·1 mA	0·2 mA
Sprayed with salt-water solution	0·175 mA	20 mA
144 hours of artificial rain	0·1 mA	——
Sprayed with salt-water solution ...	0·2 mA	——
294 hours of artificial rain	0·1 mA	——
Final spray of salt-water solution	0·2 mA	——

Below: Close-up of dirt particles being absorbed into the silicone compound coating

(1) Immediately after addition of dirt (2) After one hour, showing meniscus forming around dirt



(3) After 18 hours (4) After 24 hours

a rate equivalent to 12in per hour for four hours. The silicone compound coating was in good condition at the end of the test and the leakage current measured at 9·5 kV was under 0·1 mA. It was estimated that less than 10 per cent of the MS4 was lost during this test. Since the velocity of the rain during the test was certainly less than that experienced in practice, the test was continued for a further twelve hours, and during the last eight hours of the subsequent test, a jet of water was directed on to the top of the glass insulator. The leakage current at the termination of the test was under 0·1 mA at 9·5 kV.

The combined results of many investigations, as outlined above, show that a silicone compound increases the surface resistivity of insulators operating under conditions of high rainfall, humidity or natural or industrial contamination. The silicone compound coating besides improving surface resistivity enables insulators to be more easily cleaned since the coating will remain grease-like in service and will act as a release agent. Such silicone compounds can operate over a temperature range of −50 deg C to +200 deg C and can therefore be used in tropical or arctic conditions.

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1 "Silicone Coatings Cut Insulator Leakage," H. R. Harris, *Electric Light and Power*, March 15th, 1956.

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3 "The Insulator Contamination Problem as Influenced by Silicone Surface Coatings," J. E. Conner and A. D. Lantz, Paper 58-22, presented at A.I.E.E. Winter General Meeting, February, 1958.

A.S.E.E. Presidential Address

THE new president of the Association of Supervising Electrical Engineers, Sir Josiah Eccles, was installed by the retiring president, Sir Harold Bishop, at a meeting of the Association on 21st October. Previously, Sir Harold Bishop had presented the Association trophies and awards, among which were the Branch Merit Cup, awarded to the S.W. London Branch, the Albert Brammer trophy, the individual merit trophy, the inventions award and the A.S.E.E. diploma scheme premiums.

In his address, Sir Josiah Eccles dealt with the Association's activities. He said that the recent joint statement by the I.E.E. and the Minister of Education on the rationalisation of Higher National Certificate and Higher National Diploma courses in electrical engineering meant an increase in the number of technologists and senior technicians who would fail to qualify in future for membership of the senior electrical engineering institution. There was a real need for an organisation which would enable these men to remain in close touch with the flow of engineering developments and provide a platform for the expression of their own engineering ideas and opinions. The Association was aware of this position and had discussed with the I.E.E. how best to provide the necessary facilities for this group.

With regard to education and training, well over 300 lectures and visits had been planned throughout the country and the Association was fortunate in that many eminent engineers had agreed to prepare and deliver papers. The technical lending library facilities were being expanded and these had been strengthened in recent years with the support of the I.E.E. which had made available to the members the resources of its libraries. The diploma scheme provided for the award of the A.S.E.E. diploma and the A.S.E.E. technicians' certificate to the successful candidates in annual examinations.

Sir Josiah then mentioned the steady increase in membership of the Association in recent years, the generous support accorded to the E.I.B.A. and the continuing success of the Electrical Engineers' Exhibition.

In reviewing the growth of the electricity supply industry in this country, Sir Josiah said that output of electrical energy since 1920 had more than doubled every ten years; in fact, one-and-a-half times as much energy was now used inside the power stations to drive fans and pumps and the other auxiliary services as was sold to the public 40 years ago. Such a rate of growth had imposed considerable demands upon our capital resources and our engineering skill. In 1920, a 25 MW turbo-generator had been about the largest made. The average fuel consumption at that time had been such that at the same rate about 130 million tons would have been required for generation of electricity in England and Wales in the past year, whereas our present annual coal consumption was 44½ million tons.

Under the compulsion of economics the power supply industry and the manufacturers had made progress in developing larger, more economical and more efficient generating units. To-day 200 MW sets were in an advanced stage of construction and one 550 MW set had been ordered. All the newest sets would operate at a steam pressure of 2,300 p.s.i. and a temperature of 1,050 deg F with reheat also to 1,050 deg F. This contrasted with 300 p.s.i. and 700 deg F which had been the vogue 40 years ago.

Not only had there been advances in the design of power stations but the method of operating them had been improved. The advantages of interconnection were that spare plant was pooled; the most economical plant could be operated on full load during all the time that it was available irrespective of the local demand for electricity; generating stations could be built at the coalfields where fuel costs were the least; and for practical purposes the operational limitation on the size of generating sets was removed.

By these advances in design and improvements in operating facilities the average fuel consumption per kWh sent out from the power stations in this country was now only about one-third of that of 1920. However, the use of fuel was increasing and so far as was known, coal and oil were not being produced in the earth at anything like the rate at which they were being used. We had therefore embarked on a fairly substantial programme for the release of nuclear energy and its conversion into usable power.

Power, however, was but a means to an end and its worth depended on the use to which it was put. Sir Josiah then briefly examined the place and purpose of engineering in life and drew the conclusion that whatever the direction which scientific and engineering achievements took, it was necessary to have constantly in mind the need for the exercise of those qualities of mind that distinguished men from the machinery they employed.

Technical Papers

I.E.E. Radio and Telecommunication Section Chairman's Address

IN his chairman's address to the Radio and Telecommunication Section of the Institution of Electrical Engineers on 22nd October, Mr. G. Millington (Marconi's Wireless Telegraph Co., Ltd.) said that since much of the theoretical work involved in wave propagation was inevitably mathematical and of a forbidding nature, he decided to consider a number of loosely related topics and to illustrate them from the field of propagation.

One of the greatest problems facing research workers was the flood of papers that unceasingly poured from the technical Press. Not only was it difficult to avoid overlooking important papers, but it was often impossible in the time available to read them with discernment. Anyone who contemplated writing a paper for publication should ask himself if it was really necessary and whether the information he wished to impart was likely to be useful to others and to stimulate further advances. Moreover, greater attention should be paid to the way in which a paper was written. Admittedly, many authors had difficulty in finding the time to produce a paper at all so that the first form in which it was composed might, in effect, be the finished product. There was also a grave danger that the author might be so familiar with his work that he would tend to forget that the reader was not already equally well informed. The problem was most acute in the case of mathematical papers in which a physical problem was solved by mathematical analysis. The main line of the argument and the general conclusions could, however, sometimes be given in a section preceding the detailed analysis so that, when the reader reached the mathematics, he would be already acquainted with its purpose.

It was, however, possible never to be satisfied with one's efforts and to keep on delaying publication to include some important or new development. Such a delay could lead to the author being forestalled in publication by somebody else working independently in the same field, but priority in this was not as important as some might consider it to be. The balance should, therefore, be struck between the hasty publication of an indifferently written paper and the holding-up of work which might be of great value to others even in an imperfect and incomplete state.

Problems of Refereeing

Mr. Millington said they were fortunate in their Institution in having a system of refereeing which maintained a high standard of publication and they should be very cautious about any general relaxation in this matter. It was inevitable, with the increasing number of symposia and conventions being sponsored by the Radio and Telecommunication Section, that some latitude should be allowed to meet the tight time schedules and not to reject, if at all possible, any obviously important contributions of great topical interest.

One problem which beset referees from time to time concerned the paper that presented some striking new material which was so obscure that no one could understand it. Faced with the historical background of the treatment meted out to Heaviside, the hapless referee was anxious not to have it on his conscience that he might have condemned a work of genius. Equally, the referee would hesitate to sanction what might prove to be a lot of nonsense. When this dilemma arose the precaution was taken of appointing additional referees but, as a general guide, if a paper presenting new concepts was written for the benefit of engineers it should be understandable by the appropriate experts.

Engineering Mathematics and Intuition

The author defined " engineering mathematics " as the way engineers had of waiving the finer points of mathematical rigour. Sometimes simplicity could be achieved by making a more direct appeal to physical principles than was usual in a fully rigorous analysis. One great advantage of this method of attack was that, on occasion, it enabled the engineer to arrive at the essential form of a solution ahead of the pure mathematician. The advantage of the rigorous approach was that it provided the assurance that short-cut methods did, in fact, give a correct and complete answer. The power of the short-cut methods lay in the simplicity with which they could often be extended to more general cases where the rigorous attack encountered great mathematical difficulties.

Notation

They all knew the difficulty of reading a paper, even on their own special subjects, in which the notation was quite different from that with which they were familiar, and no one would dispute that it would make life much easier if an agreed system was to be universally adopted. The author felt that this was a counsel of perfection and although we should strive towards it, he could see very little hope of attaining it on a national, let alone an international, scale. Certainly they should avoid making it an end in itself, creating the impression, as was sometimes done, that a paper was not correct unless it used some particular notation and adopted the M.K.S. system of units. It was far more important to describe the notation that was being used either in a special list at the beginning of the paper or as the symbols occurred.

Speculative Reasoning

The author concluded with some thoughts on the use of highly speculative reasoning to build up an elaborate theory. In the case where the author had been carried away by a daring argument in one paper, he found some solace for his inability to think on such lines when he came across another which proved conclusively that the previous one was completely wrong since it took no account of some incontrovertible fact. It was, however, with these flights of imagination that true progress was made for they were the rare spirits who ventured into the unknown and brought back strange stories of what they had seen.

F.B.I. MEETING

The annual general meeting of the London and South Eastern Region of the Federation of British Industries is to be held at the Café Royal, Regent Street, London, W.1, on 20th November. It will take the form of a luncheon at which Sir Norman Kipping, director general of the F.B.I., will speak on the recent activities of the Federation. Tickets (25s each) are available from Maj.-Gen. R. Briggs, 21, Tothill Street, London, S.W.1.

I.E.E. SUB-CENTRE CHAIRMEN

FURTHER BIOGRAPHIES AND PORTRAITS

WE published the biographies and portraits of some of the Sub-Centre chairmen for 1958-59 of the Institution of Electrical Engineers in our issue of 10th October, and we now give brief details of the chairmen of the remaining Sub-Centres.

Mr. F. A. Benson, Ph.D., D.Eng., A.M.I.E.E. (Sheffield) has been lecturer in electrical engineering in the University of Sheffield since 1949. He was educated at the University of Liverpool and in 1943 joined the research staff of the Admiralty Signal Establishment, Witley. In 1946 he was appointed assistant lecturer in electrical engineering in the University of Liverpool and held this position until taking up his present appointment at Sheffield. He has been active in the affairs of the Sheffield Centre of the I.E.E., being consultative member of the Graduate and Student Section and a member of the Students' Paper Grant Sub-Committee. He has also been a member of the Papers Committee of the Sub-Centre. Among his many other activities Dr. Benson has served on a number of committees of the Sheffield Centre of the Illuminating Engineering Society of which Centre he was chairman for 1956-57.

Mr. C. E. Smith, B.Sc.(Eng.), A.M.I.E.E. (North Lancashire) is system planning engineer, No. 4 Sub-Area, of the North Western Electricity Board. He received his education at Bradford Technical College and his training with the Bradford Electricity Department, where he subsequently became mains assistant. He went to Sheffield in 1937 first as assistant technical engineer in the Mains Department of the electricity undertaking, and subsequently became senior substation assistant and assistant substation engineer. This was followed by appointments as deputy distribution engineer at Blackpool (1946), and mains superintendent at Carlisle (1947). In 1948 he was appointed district engineer, Carlisle, N.W.E.B., and later in the same year he took up his present position.

Mr. J. Mendelson, M.I.E.E. (South-East Scotland) is serving as chairman of the Sub-Centre for the second successive year. He is Scotland and Ireland area manager for Ferranti, Ltd. Mr. Mendelson received his education at Monterrey (Mexico), Berlin, Amsterdam and London, and took an electrical course at the Regent Street Polytechnic. After serving a student apprenticeship with the British Thomson-Houston Co., Ltd., at Rugby, and a period with Standard Telephones & Cables, Ltd., he was engaged as electrical engineer on the Shannon scheme construction for Siemens-Schuckertwerke with whom he later spent six months in Berlin on power plant tendering for export. He joined Ferranti, Ltd., in 1929 as North Europe representative, and later became technical representative of the company for Scotland and Ireland, before being appointed to his present position in 1945.

Dr. F. A. Benson

Mr. J. Mendelson

Mr. W. Adam

Mr. W. Adam, B.Sc., A.M.I.E.E. (South-West Scotland) has spent the whole of his career with the British Thomson-Houston Co., Ltd., and is now manager of the company's Glasgow district office. After graduating at Glasgow University, he joined the B.T.H. Co. as a student apprentice in 1924, and has held the successive appointments of technical sales engineer at the Newcastle and Glasgow district offices (1928-48), and assistant manager of the Glasgow district office (1948-49), being appointed to his present position in the last-mentioned year.

Mr. E. M. Price, M.A.(Cantab.), M.I.E.E., M.I.Mech.E., M.I.Prod.E. (Rugby) is general manager, Rugby, of the English Electric Co., Ltd. He was born in Johannesburg and received his education at Marlborough College and King's College, Cambridge. He became assistant to the manager at Rugby of the English Electric Co. in 1940, was appointed deputy manager, Rugby Works, in 1943 and was manager from 1945 to 1954. Mr. Price is also managing director of the English Electric, Babcock & Wilcox, and Taylor, Woodrow Atomic Power Construction Co., Ltd., and a director of the English Electric Export & Trading Co., Ltd.

Mr. E. M. Price

Mr. S. R. Urquhart, A.M.I.E.E., A.M.I.Mech.E. (North Scotland) is power station superintendent at Aberdeen for the North of Scotland Hydro-Electric Board.

Transmitters for B.B.C. Overseas Service

TWO 100 kW twin-channel transmitters employing evaporation cooling (or steam cooling, as it is sometimes called) have been ordered by the British Broadcasting Corporation from Marconi's Wireless Telegraph Co. These equipments have been specially designed for the Corporation's Overseas Service, and will be situated at the transmitting station at Rampisham in Dorset, which is being re-equipped. The transmitters will be the first using steam cooling to be manufactured in Britain.

Both installations have two entirely separate radio frequency channels, housed in their own cabinets and mounted one on each side of a common modulator and supply unit. Either r.f. channel can be fed from the modulator and power supply unit, while the r.f. channel not in use can be set up for a desired frequency in its quiescent period. Only a simple switching operation, carried out in a few seconds, is necessary to change over from one r.f. channel to the other.

Evaporation cooling has been chosen because of the advantages of economy associated with this type of equipment. The steam generated from the water surrounding the valves is taken by convection to an air cooled condenser and returns by gravity feed to the valve water jackets after cooling.

VIEWS on the NEWS

By REFLECTOR

LAST year the South of Scotland Electricity Board carried out an experiment in Kirkcaldy, Falkirk and Edinburgh which, the Board says, was so successful that it proposes to extend the scheme to the whole of its area in due course. The idea is that at one quarter date in each year consumers will receive bills based on estimated consumption, meter reading for that quarter being dispensed with. Any differences will be adjusted after the meters have been read for the following period. By this means the number of meter readers will gradually be reduced, as they resign or retire; it is not proposed to "sack" any of them. This seems to be quite a good plan, although I suppose that there are arguments if on a subsequent meter reading a consumer finds that he has previously been considerably under-assessed and is faced with a much larger bill than he has been accustomed to.

* * *

The West Dean Rural District Council is resisting a proposal by the Midlands Electricity Board that it should either contribute to the capital cost of supplying electricity to fourteen houses or install extra points. The chairman of the Housing Committee said, as reported by the Gloucester *Citizen*:—

> "They were satisfied they were already putting down sufficient points to satisfy the needs of an average person, and if they put more it would be at the expense of some other necessary thing."

To show that there was no ill feeling, the Council's chairman paid a tribute to the work of the Board in the electrification of the Cotswolds, saying:—"I think they are quite a nice lot of chaps."

* * *

An application from a tenant to be allowed to replace the gas cooker in his Council house by an electric cooker has been turned down by the Newry (Northern Ireland) Urban Council. A report in the *Belfast Telegraph* states that one member of the Council said that

> "if any person applying for a council house was not prepared to use gas cookers the applications should be refused. The local gas undertaking was owned by the Council and they must do everything possible to keep the local industry going."

The Town Clerk reminded members that it was not so long ago that the Council would not allow tenants to install electric light. All this is reminiscent of earlier days in this country when local authority gas committees (successfully for a time) did all they could to stop the advance of electricity.

* * *

This sort of thing seems to be common in Ulster. The Northern Ireland Electricity Board has suggested to the Omagh Urban Council that some houses which are being erected for the Council should be equipped with electric cookers to avoid the necessity of a guaranteed payment for electricity. One member said at a meeting of the Council that the Council had its own gas undertaking and up to the present gas cookers had been installed in all the Council's houses. After that it was rather surprising that another councillor should say that the Electricity Board was "trying to get a monopoly."

* * *

A "$100,000 Housepower Contest" was recently organised by the Edison Electric Institute (New York). Entrants were required to provide a suitable caption for a drawing of a harassed husband trying to find a point into which to plug a radio set. All around were straying flexes with multiple adaptors which were already occupied by a variety of appliances. It was also necessary to complete a questionnaire about the entrant's own home installation. The results were published in the September issue of the Institute's *Bulletin* and a letter was published from the winner of the first prize ($5,000). The names of the three other leading prizewinners were also given. To my disappointment, however, I was unable to find in the report the winning captions. Was the omission a safeguard against thousands of protests from unsuccessful contestants whose captions (to their minds) were far better?

* * *

About 70 maintenance men at Goldington power station stopped working for one day last week, their object being to force a speeding-up of wage negotiations. According to a Press Association report a spokesman for the men said:—

> "We wish to make it clear that this is not a strike. . . . The unions are not concerned in it. It is a spontaneous effort."

This seems to add a useful phrase to the industrial disputes vocabulary.

* * *

Having regard to subsequent events there is something a little amusing about this eighty-year-old note from the *Electrical Review* (1st November, 1878):—

> "EDISON'S ELECTRIC LIGHT.—We hear that a year ago Mr. Edison discovered a new material which can be rendered luminous by the passage of the current through it, without wasting away. With this material the circuit is perfectly continuous and steady. Edison's system of lighting probably unites this electric wick with a new mode of subdividing the current. Every effort is being made to secure the patents in almost all civilized countries, and as soon as that is done the process will be exhibited in this country. Numerous applications for the sale of the patents or for licenses under them have been already received by Mr. Adams, Edison's London agent. This gentleman has publicly denied the prevalent rumours that 'the whole thing is a hoax.' A company has already been formed to introduce the light in America; and the English and foreign patents have been applied for."

PERSONAL AND SOCIAL

News of Men and Women of the Industry

Mr. F. J. Erroll, M.A., M.I.E.E., A.M.I.Mech.E., M.P., has been appointed Economic Secretary to the Treasury; since 1956 he had been Parliamentary Secretary to the Board of Trade. Mr. Erroll is well-known in the industry through his former associations with some of the leading electrical concerns and his past contributions to the *Electrical Review*.

C. A. Parsons & Co., Ltd., announce that the United Kingdom Atomic Energy Authority has agreed to release **Dr. H. M. Finniston,** at present head of the Metallurgy Division at the Research Establishment at Harwell, to become research manager of C. A. Parsons' Nuclear Research Centre in Newcastle. All nuclear and other research work relating to the reactor is the responsibility of Parsons within the organisation of the Nuclear Power Plant Co., Ltd., of which they are a member company.

The Minister of Power has appointed **Mr. F. L. Parkin,** B.Sc.(Eng.), M.I.E.E., of Sheffield, to be a member of the Yorkshire Electricity Consultative Council. **Mr. J. L. Gaskell,** B.Sc.(Eng.), M.I.E.E., of Scunthorpe, has retired from the Council on completion of his term of office.

The Export Department of Marconi's Wireless Telegraph Co., Ltd., has been transferred from the company's London office to the head office at Chelmsford. **Mr. W. J. Richards** has relinquished his position as export manager to become assistant to the general manager on export matters, and the following new appointments have been made. **Mr. A. E. Shepherd** is appointed manager, Export Department, with overall responsibility for export sales promotion and overseas representation and for the policy decisions of the associated companies division, of which he was manager before his present appointment. This division has now become a part of the Export Department. **Mr. I. O. Mortada** becomes export sales manager, and is responsible to the manager, Export Department, for export sales promotion throughout the world. **Mr. B. T. Turner** becomes assistant manager, Export Department, responsible for administrative matters in connection with overseas representation.

Mr. A. E. Shepherd

Mr. I. O. Mortada

Mr. R. Hugh Jones, M.Sc., M.I.E.E., M.I.Mech.E., who has been with the Crown Agents for Overseas Governments and Administrations since 1949, has been appointed chief electrical engineer of a new Electrical Engineering Department which the Crown Agents are establishing as from tomorrow (Saturday) to deal with the electrical engineering and telecommunication business which they transact on behalf of their principals. Mr. Jones has previously served in Malaya and also in Ghana where he was chief mechanical and electrical engineer of the Public Works Department.

Mr. T. Blyth has been appointed home sales manager of S. N. Bridges & Co., Ltd. He joined the company six years ago as area representative and has been for over three years Midland sales manager. Following war and post-war service as an officer in the Royal Fusiliers and the Royal West African Frontier Force, Mr. Blyth joined Chloride Batteries, Ltd., and was later with E. R. Howard, Ltd.

Mr. T. Blyth

Davis & Timmins, Ltd., has reorganised its Sales Department and the following appointments have been made:—**Mr. J. Whitelock,** to be area sales manager, Midland Region; **Mr. M. Kelly,** to be area sales manager, London and Home Counties; **Mr. N. F. Fidler,** area sales manager, Northern Region; and **Mr. A. C. Jones,** area sales manager, Western Region. **Mr. E. B. M. Grubb** is general sales manager.

Sir John Cockcroft, Scientific Adviser to the Minister of Defence, was the principal guest at the 22nd annual dinner of the **B.T.H. Overseas Association** held at the Masonic Hall, Rugby, on 17th October. The dinner was attended by directors, managers and a number of other guests. Sir John was welcomed and introduced to the Overseas Association Committee by their chairman, Mr. L. Drucquer (director, B.T.H., and divisional general manager, A.E.I. heavy plant division).

Sir John Cockcroft speaking at the annual dinner of the B.T.H. Overseas Association. Mr. G. S. C. Lucas (director and chief electrical engineer, B.T.H.) is on the right

Mr. G. S. C. Lucas, director and chief electrical engineer, presided, and Dr. K. J. R. Wilkinson, head of the engineering division, B.T.H. Research Laboratory, in proposing the toast to the guests, referred to the advances made in the world of science due to Sir John Cockcroft's work. In reply, Sir John spoke of his associations with B.T.H. both as an apprentice and later in connection with his scientific work. He then commented on the importance of the production of uranium in the British Commonwealth, the scope which this offered for electrical equipment, and the economics of nuclear power stations. In proposing the toast of the company, Mr. G. O. Parnell, a South African apprentice member, congratulated the company on its training course for overseas graduate apprentices and Mr. J. G. Boddy (a past-president of the Association) urged that the two Overseas Associations of B.T.H. and M-V should merge their identity in a Union to be known as the Associated Electrical Industries Overseas Union. Mr. W. A. Ankerson proposed the toast of "The Association," to which Mr. I. A. Ferguson (manager, large electrical machine sales, A.E.I. heavy plant division) replied.

Dr. and Mrs. J. N. Aldington left by air for Salisbury last week-end. Dr. Aldington is group managing director of Siemens Edison Swan, Ltd., one of the three main companies in the Associated Electrical Industries group. During his stay in South Africa Dr.

Aldington will be visiting Government personnel, particularly those associated with the Department of Posts and Telegraphs, with which his company has had a long association. He will also be present at the official opening of the new telecommunications factory which is being established at New Era, Springs, and is jointly owned by the Automatic Telephone & Electric Co., Ltd., and Siemens Edison Swan, Ltd., both of whom have recently signed a new long-term agreement for the supply of telephone equipment to the South African Government. Dr. Aldington has also been invited by the South African Institute of Electrical Engineers to give lectures in Johannesburg and Cape Town.

Mr. D. J. Dowling, B.Sc.(Eng.), Graduate I.E.E., writes in this issue (page 808) on "Silicone Compound Treated Insulators." He was educated at King's College, London, and served his graduate apprenticeship with the British Thomson-Houston Co., Ltd., at Rugby and Willesden. Mr. Dowling served in the Royal Navy as an electrical officer in frigates from 1954 to 1956, followed by one year as an engineer in the Switchgear Engineering Department of the B.T.H. Co. at Willesden where he was engaged on the design of switchgear substations. Mr. Dowling is at present engaged with Midland Silicones, Ltd., in the promotion and application of silicone insulating materials and silicone insulating equipment.

Mr. E. Tauchert, M.I.Mech.E., F.B.H.I., has been appointed managing director of Venner, Ltd. He was formerly works director, having previously been the general works manager.

Mr. E. Tauchert

Mr. Tauchert joined Venners as personal assistant to the managing director in 1942 and later became manager of the No. 2 factory, producing aircraft instruments. When this factory closed in 1945 he was appointed general works manager of Venner Time Switches, Ltd.

A team of **Prestcold** executives recently left Oxford for the United States where they are making an extensive tour to study American conditions in connection with products of many types used in the home. The party, led by Mr. E. G. Rowledge, senior director, Prestcold Division, includes Messrs. G. W. Nunn (chief engineer), M. R. Harry (market research officer), M. Horris (domestic sales manager) and E. G. Rowledge (senior divisional director).

The E.A.W. announces the appointment of **Miss A. S. Lockhart,** B.Com.Sc., as assistant secretary, with continuing responsibility as accountant.

Miss P. J. Thompson, B.A., press officer, who has been acting editor of *The Electrical Age* for some time, is appointed editor.

Mr. T. Wilkie, on retiring as public lighting engineer to the Leicester Corporation, has been appointed street lighting consultant to Atlas Lighting, Ltd. After attending Glasgow Technical College, Mr. Wilkie joined the Glasgow Street Lighting Department where he worked from 1910 to 1923 under the late Mr. Langlands, and moved to Leicester in 1923 to initiate a lighting department. Mr. Wilkie was a founder member of the Association of Public Lighting Engineers; he served on the Council from 1923 to 1947, and was president in 1931 and 1947. He has been a member of the Illuminating Engineering Society since 1924 and a Fellow since 1941. He has taken a great interest in the City and Guilds examinations and was a member of the Advisory Committee for many years. He has also represented the A.P.L.E. on the National Safety Committee of the Royal Society for Prevention of Accidents and at the Public Works Congress on the Council and on the Executive Committee. Mr. Wilkie will continue to live in Leicester, and is operating from the area office of Atlas Lighting, Ltd., 24, Sheepcote Street, Birmingham, 15.

Mr. T. Wilkie

Chloride Batteries, Ltd., held their customary Motor Show luncheon at the Clarendon Restaurant, Hammersmith, on 22nd October. Mr. A. W. Browne, O.B.E., M.I.E.E., chairman of the company, presided and proposed the toast of "The Press and Guests," to which Mr. C. Clark Ramsay and Col. A. M. Wilkinson, D.S.O., replied.

The South Wales Electricity Board has made the following appointments of district managers, thus completing its plan for introducing single-headed management for all its eighteen District organisations. The new managers will take up their appointments on 1st December next.

Mr. E. Broughton, A.M.I.E.E., will be responsible for the Rhondda District. He entered the electricity supply industry in 1925 as a trainee with the former Rochdale Corporation Electricity Department and later served with the Southport Corporation Electricity Department and the Altrincham Electric Supply, Ltd. In January, 1949, he was made district engineer for the South West District of the North Western Electricity Board, a post he held until 1954 when he took up his present appointment as construction, operation and maintenance engineer for the Mid-Sussex Area of the South Eastern Electricity Board at Brighton.

Mr. C. Evans

Mr. C. Evans, A.M.I.E.E., will take over the Llanelly District. He was educated at Ystalyfera Grammar School and Swansea and Newport Technical Colleges, and commenced his career with the former Brynamman & District Electric Supply Co. In 1937 he joined the former South Wales Electric Power Co., with which he served in various capacities until 1946 when he was appointed assistant meter engineer to the Wessex Electricity Co. In 1949 he returned to South Wales to take up an appointment as meter engineer for the South Wales Board's Swansea and West Central Area, being appointed assistant chief engineer (meters) at the Board's head office in 1955, a post he will now relinquish to take up his new appointment at Llanelly.

Mr. J. H. Harley

Mr. J. Harley, M.I.E.E., A.M.B.I.M., who is to become the manager of the Bridgend District, has been district commercial manager for the Board's Llanelly District since 1950. Educated at Stirling High School and Leeds Central Technical School, Mr. Harley served his apprenticeship with Cameron Harley, Ltd., before entering the supply industry in 1925 when he became assistant engineer in the Pudsey Corporation Electricity Department. After holding various appointments with the Yorkshire Electric Power Co. and the West Midlands Joint Electricity Authority he was appointed district engineer for the Shrewsbury District of the Midlands Electricity Board in 1948, going to South Wales in 1950.

Mr. A. J. Leather

Mr. A. J. Leather, A.M.I.E.E., who will manage the Merthyr and Aberdare District, was educated at Wigan Grammar School and the Wigan and District Mining and Technical College. He commenced his service in the industry in 1938 when he joined the former Wigan Electricity Department as a junior mains engineer. He held various appointments with the Shipley U.D.C. and the Yorkshire Electricity Board before taking up an appointment as district engineer for the Shrewsbury District of the Midlands Electricity Board in 1951. He held

this post until 1956 when he was appointed district engineer for the South Eastern Electricity Board's Central Sussex District centred on Hayward's Heath, a post he will now relinquish to go to South Wales.

The second annual Gregory Award, presented for the year's most outstanding contribution in the field of semi - automatic electric arc stud welding, has been won by **Dr. J. C. Chapman,** of the Civil Engineering Department, Imperial College of Science and Technology, London, for his paper on "The Application of Stud Welding to Vibrating Wire Strain Gauges." The $1,500 award is sponsored by Gregory Industries Inc., Loraine, Ohio, who are licence associates of Crompton Parkinson (Stud Welding), Ltd., and Dr. Chapman received his award at the American Society for Metals awards luncheon held in Cleveland, Ohio, on Tuesday last.

Dr. J. C. Chapman

The following staff changes at the Atomic Energy Research Establishment, Harwell, are announced by the United Kingdom Atomic Energy Authority:—**Dr. J. V. Dunworth,** formerly head of the Reactor Division, has been appointed assistant director (reactor research policy). In this post he will be special adviser to the Director of Harwell. He is succeeded as head of the Reactor Division by **Mr. T. M. Fry,** who has been a deputy head of the Division.

Dr. Peter Thonemann, head of the Controlled Thermonuclear Reaction (Fusion) Division, has been granted study leave for one year from March next. He will be going to the Institute of Advanced Studies in the University of Princeton, where he will work on plasma physics. In his absence the Harwell fusion programme will be carried forward by his deputy, **Mr. R. S. Pease,** under the supervision of **Mr. D. W. Fry,** who is deputy director of Harwell with special responsibility for this work. Dr. Thonemann will be available for consultation.

Mr. H. P. Lord, A.F.C., B.Sc., general sales manager of Sigmund Pumps, Ltd., has been appointed to the board of the company.

About 200 members of the staff of **Collins Electrical, Ltd.,** and guests, were in attendance at the annual dinner and dance of the company at the Ardington Rooms, Clapham Junction, on Friday last. Mr. C. E. Collins (chairman and managing director) was in the chair. As is always the case with this particular function, speech making was kept to a minimum and, apart from the loyal toast, the only toast of the evening was that to "Our Friends," proposed by Mr. R. W. Philps. A brief and humorous response was made by Mr. M. Walford. The opportunity was also taken to present a gold wristlet watch to Mr. G. Pearce to mark the completion of twenty years' service with the company. An excellent cabaret, followed by dancing, rounded off a successful social evening.

The annual dinner of **Rich & Pattison (B'ham), Ltd.,** was recently held in Birmingham. A gathering of some 140 staff and friends of the company attended and afterwards proceeded to a theatre. Speaking during the course of the evening Mr. W. L. Rich welcomed the guests and reported a satisfactory year. He also announced that the company had recently acquired a site and that it was hoped to commence building operations in the New Year.

At a recent meeting of the directors of Marco Refrigerators, Ltd., **Mr. E. G. Batt** was reappointed chairman of the company for a period of five years as from 22nd October. **Mr. R. J. Simpson** was appointed vice-chairman.

The members of the **Association of Electrical Machinery Trades,** their ladies and their guests held yet another successful function in the Lancaster Suite of the Savoy Hotel, London, on 17th October. The function was presided over by Mr. C. G. Aldridge, director of Hirst Electronic, Ltd., and chairman of the Association, and the principal guest was Mr. J. Strong, president of the Institute of Welding. As is usual with A.E.M.T. functions, the speeches by Mr. Aldridge and Mr. Strong were commendably brief but to the point, and those present then proceeded to enjoy a full evening's programme of dancing with a break for an excellent cabaret given by Barrie Manning's Champagne Cabaret.

At the A.E.M.T. dinner. Left to right: Mrs. C. G. Aldridge, Mrs. J. Strong and Mr. J. Strong

Mr. F. Sykes, chief engineer of the Electricity Commission of New South Wales, gave a luncheon at the Bath Club on 21st October before his departure for the United States, en route to Australia, to the representatives of the Commission and engineers of the Commission residing and taking training courses in England. The guest of honour was the Hon. F. P. Buckley, Agent-General for New South Wales, who was accompanied by the Official Secretary, Mr. A. J. Thomson. Also present were the Advisory and Inspecting Engineer to the Government of New South Wales, Mr. A. L. Fielding, Mr. Ranald J. Harvey (Messrs. Ranald J. Harvey & Partners) and Mr. J. F. Magee (Messrs. Preece, Cardew & Rider).

The **Electrical Industries Benevolent Association** has announced that all tickets for the Electrical Industries Ball, to be held on 14th November, have been sold.

Mr. R. F. Webb, B.Sc., Ph.D., formerly a lecturer in natural sciences at Cambridge University and a Fellow of Trinity Hall, Cambridge, has joined the staff of CIBA (A.R.L.), Ltd., Duxford, where he will direct the activities of a number of specialist groups engaged in long-term research in new plastics materials.

Dr. R. F. Webb

In our last issue a number of appointments in the manufacturing departments of the Metropolitan-Vickers Electrical Co., Ltd., were reported. The company now informs us that **Mr. V. D. Swain** has been appointed assistant superintendent of the Control Department, and not superintendent as previously notified.

Sir Donald Bailey, O.B.E., J.P., director of the Ministry of Supply's Military Engineering Experimental Establishment at Christchurch, Hants, has been co-opted to the Council of the British Welding Research Association.

Mr. J. F. Morris, A.M.I.Plant E., has been appointed area manager of their Birmingham office by Dewhurst & Partner, Ltd.

The North Western Branch of the **Electrical Trades' Commercial Travellers' Association** held its annual luncheon on 17th October, at the Queens Hotel, Manchester. The guest speaker was Canon F. Paton-Williams, who proposed the toast to the Association, Mr. W. W. Blears (Branch chairman) responding. In proposing the toast to the guests, Mr. R. H. Corlett (past-chairman) appealed to members to introduce new members to an Association with such praiseworthy objects. Mr. O. Dearden (president, Manchester Branch, Radio Industries Club) replied. Mr. H. Etchells made

an appeal for the E.I.B.A. and a collection realised £21. Mr. G. P. Humphry (vice-chairman) was the toastmaster. Among those present were Mr. T. C. Browne (chairman, Midlands Branch), Mr. F. Linley (manager, No. 1 Sub-Area, N.W.E.B.) and Mr. F. Westwood (purchasing officer, N.W.E.B.).

Mr. N. B. Brooks, M.C., has joined the board of Keelavite Hydraulics, Ltd. He is vice-chairman of Richard Johnson & Nephew, Ltd.

Sir Edward de Stein has resigned from the board of Electric & Musical Industries, Ltd. Sir Edward has been a director of the company since its incorporation, and for many years previously was a director of the Columbia Graphophone Co., Ltd. **Mr. R. Dawes** and **Mr. J. E. Wall** have been appointed directors of the company. Mr. Dawes has held the position of comptroller of the E.M.I. Group for some years, and whilst continuing for the time being in that capacity, he will also carry out special duties allotted to him by the board. Mr. Wall, formerly the head of the organisation division of Unilever, Ltd., will assume the position of director of planning. He will be responsible for instituting co-ordinated planning systems throughout the group and for advising managements at all levels on methods, procedures and organisation.

OBITUARY

Mr. John Parr-Morley, M.M., construction engineer in the Northern Sub-Area of the London Electricity Board and a past-president of the Electrical Power Engineers' Association, died on 21st October. Educated at Malvern College, King's College and Regent Street Polytechnic, he had a varied engineering experience before going to Hackney as mains engineer. A professional soldier in the 1914-18 war and afterwards, he later maintained a service interest with the Territorial Army, retiring with the rank of honorary colonel. He had been particularly active in the E.P.E.A. and, in addition to his presidency in 1955, was secretary for over twenty-five years of the London Technical Group. He was a member of the National Executive Council and served on No. 1 District Joint Board, the National Joint Board and the National Joint Advisory Council of the Electricity Supply Industry.

Mr. Frank James Brown, C.B., O.B.E., a pioneer of radio telegraphy, died on 22nd October at the age of ninety-three. Mr. Brown retired from the General Post Office in 1925 after thirty-eight years' service, during which he was closely connected with the development of telephones, cables, radio and broadcasting. He was for a number of years assistant secretary in charge of the Government cables and wireless services and played a prominent part in connection with the Imperial Communications Committee, with the Peace Conference of 1919 (where he was expert adviser on telegraph communications to the British Delegation), as senior British delegate at the Washington Conference on Electrical Communications and so on. He had been a member of the broadcasting committee which Sir William Joynson Hicks appointed in 1923 and of the permanent Broadcasting Board of the Post Office. On his retirement, Mr. Brown became director and adviser of the International Telegraph Companies' Association, which was formed at that time to deal with matters of common interest to submarine cable companies.

Mr. C. A. Gillin.—The death occurred at Lancaster on 16th October of Mr. Charles Arrowsmith Gillin, A.M.I.E.E., who was with the former Bradford electricity undertaking for nearly fifty years (latterly as mains engineer), retiring in 1946.

Mr. J. F. Field.—The death occurred at Sevenoaks, Kent, on 20th October, of Mr. James Frederick Field, B.Sc.(Edin.), M.I.E.E., M.I.C.E., M.I.Mech.E., former divisional controller of the South East Scotland Division of the British Electricity Authority. After the Division was taken over by the South of Scotland Electricity Board in 1955 he was employed in the C.E.G.B. headquarters Engineering Department, under the chief engineer, on special duties connected with the development of plant and equipment to operate on the Field cycle.

The late Mr. J. F. Field

Mr. Field, who was born in 1903, graduated at Edinburgh University, after which he joined the British Thomson-Houston Co., Ltd., at Rugby as a student apprentice, later being employed as a steam turbine erector, designing engineer, and contract engineer on turbine sales. He went to America in 1930, and after some time with the General Electric Co. in Schenectady, he joined the Brooklyn Edison Co.'s plant equipment bureau. On his return to England he carried out a large factory reconstruction work for the Calico Printers' Association, Manchester, before joining the staff of the Central Electricity Board at the end of 1933. In 1940 he was appointed deputy engineer and manager of the Edinburgh Electricity Department, becoming engineer and manager in 1944. On nationalisation he was appointed controller of the South East Scotland Division of the B.E.A.

WILLS

Mr. D. S. Riley, joint managing director of Riley & Neate, Ltd., who died on 23rd April last, left £7,193 gross (£6,293 net).

Mr. W. H. Williams, former director of the General Electric Co., Ltd., and manager of its Osram Lamp Department, who died on 7th July last, left £7,917 gross (£7,818 net).

Hire-Purchase Control Lifted

The remaining restrictions over hire purchase and rental agreements were removed as from Wednesday last when the ten Board of Trade Orders controlling hire purchase and credit sales and rental transactions were revoked. Last month capital goods and a range of consumer goods, including furniture and cookers, were removed from the control. The goods still subject to control were in the main motor cars, radio and television sets and certain household goods. The Board of Trade states that the situation, with credit conditions easier, now justifies removal of all other goods from the control.

The revocation means that the initial down payment and the period covered by the hire purchase or rental agreements will now be a matter for the trader himself to settle with his customer. The revocation of these Orders does not affect the protection accorded to hirers under the Hire Purchase Acts.

PRICES OF MATERIALS

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton £180 0s 0d
COPPER, H.C. Electro	ton £246 10s 0d
Fire Refined 99·70%	ton £245 0s 0d
Fire Refined 99·50%	ton £244 0s 0d
COPPER Tubes ..	lb 2s 4½d
Sheet	ton £277 5s 0d
H.C. wire and strip ..	ton £293 5s 0d
LEAD, English ..	ton £76 5s 0d
Foreign	ton £75 0s 0d
MERCURY	flask £78 0s 0d
TIN, block (English) ..	ton £747 10s 0d
ZINC, G.O.B. Foreign	ton £74 5s 0d
BRASS Tubes (solid drawn)	lb 1s 11½d
Wire	lb 2s 8½d
PHOSPHOR BRONZE Wire	lb 4s 2d
PLATINUM	oz £21 5s 0d
RUBBER, No. 1 R.S.S. spot	lb 25½d—25⅝d

TECHNICAL INQUIRIES AT BRUSSELS

The technical inquiry office of the British Electrical and Allied Industry's exhibit in the British Industry Pavilion at the Brussels Exhibition was staffed throughout the six months by a team of engineers and interpreters. At least eight people were on duty at any one time, covering between them most European languages, including Russian, as well as Arabic and Esperanto.

Thousands of questions were answered on the spot, but inquiries needing more detailed replies were recorded and sent without delay to all the 160 firms supporting the collective exhibit. These inquiries totalled 927 and came from nationals of fifty different countries.

INDUSTRY AND THE HOUSE

By A. M. F. PALMER, A.M.I.E.E., M.Inst.F., M.P.

BY the time these notes are published the new and probably the last session of the present Parliament will have been opened by Her Majesty and that ubiquitous servant electrical science will have made the gorgeous House of Lords ceremony wide open to millions of television viewers.

Politically, this is bound to be a session in which the two sides (or should I say three ?) will tread warily. Their thoughts will be much of the time, I am afraid, on the voters who will have to decide between them at the General Election. With so many Gallup and other pollsters about I would hesitate to enter on prophecy about the outcome of the coming battle, but in anticipation, like the Duke of Wellington in retrospect speaking of Waterloo, I feel the election is going to be a "d——d close run thing."

Industrial matters are certain to play a prominent part in coming Commons' debates with emphasis on capital investment and the growth of unemployment. There will be a lot of discussion, for instance, on the right balance to be struck between the danger of renewed inflation and the political risks that go with less than full employment. On the Conservative side there will be awkward, frank fellows like Mr. Osborne who will say a free economy demands a margin of unemployment. Also, eccentrically, on the Labour benches there will be here and there voices crying that to ensure full employment without inflation you must bring in a full set of physical controls. But more adroit people—Tories and Socialists alike—appreciate very well that *both* unemployment and controls are unpopular with the electors. If left to themselves they are prepared to walk the knife edge between expediency and reason hoping that somehow a miracle will give plenty of jobs, flowing dividends, full investment, high wages and lower prices once they are back. It may be all very difficult but these electoral realists are always prepared to have a go.

But while we are still waiting for Parliament to begin let us take a short look at the industrial aspects of Scarborough and Blackpool. At the Labour conference, Mr. Harold Wilson, M.P., opened the big debate on the policy document "Plan for Progress." This aims to tie together earier statements and make them into some kind of economic master plan. Mr. Wilson emphasised the need for both full employment and full production. Without these he said there could be "no social progress and no social justice." He complained that under Conservatism the economy had become "stagnant." The improvement in the national balance of payments was attributable solely to good luck in the fall of import prices.

Mr. Wilson contended that if production had risen since the Conservatives had been in office at the rate it had in the years immediately after the war we would have had each year £3,700 million more of reserves for consumption, investment, the social services, exports and colonial aid. Referring to an issue on which the Labour Party is still understandably sensitive, he said that the consequent annual loss was equivalent to "one hundred ground nut schemes every year." A Labour Government would insist on more investment in industry and more modernisation, with the whole thing "purposefully directed." The first priority would be to maintain the strength of the £ which, he said, was not a party but a national asset.

He attacked those Conservatives who, he alleged, had hinted darkly about "a run on the £" if another Labour Government was elected. Such talk was anti-democratic and constitutionally dangerous. Mr. Wilson spoke with feeling. Lord Hailsham has since replied to the effect that any possible threat to the stability of the £ under a Labour Government is caused by Labour's expected policies rather than by Conservative scaremongering. However, allowing for inevitable party manœuvring, I think it was useful for the point to be made. Sound stable government in a modern democracy depends for success on the practical co-operation of both sides of industry—and the City of London—with elected Governments, apart altogether from the private political opinions of individuals.

From the general debate, which at Scarborough followed Mr. Wilson's opening, I have space only to pick out two speeches. One was that of Mr. Desmond Donnelly, M.P., which at a Labour conference required some courage to make. The other was that of Mr. Frank Cousins, significant because of his position as leader of the important Transport and General Workers' Union. Mr. Donnelly thought the party was in danger of not facing up to the true implications of its own policy. The fact was it could not do too much at once. Everything must depend on a rising curve of production. There was a limit to the welfare state; the limit was the capacity of the people who pay for it. If he had to make a choice between a machine tool factory and a hospital, he would select the factory because this would mean a better hospital in the end. Mr. Donnelly's reception was a little mixed I am afraid.

Mr. Cousins made it clear that the trade unions would co-operate to the full with a Labour Government in the expectation that they would receive fair treatment; at the same time they are determined, according to Mr. Cousins, not to be taken for granted.

To turn to the economic debate at Blackpool; this was not as long as the Labour debate and had a rather different emphasis. Here was a clash between economic "liberals" who look more to Europe and the world generally for the expansion of British trade and the Tory traditionalists who think still more in terms of the home market and Commonwealth relations. It is doubtful if the rank and file of the Conservative Party appreciate just how much internationalism they have been committed to by their leaders. Hence, it was natural that the Chancellor of the Exchequer, in replying to the debate should, after accepting that strength began at home, then go on very cautiously to talk about the "effect of co-operation in the widest field."

In answer to Scarborough arguments, Mr. Amory said the Conservative resolve was to guide the country safely between the twin hazards of inflation and deflation. There was now something like a balance in the country's economy. He wanted always the highest level of production and employment that could be obtained provided it was consistent with price stability.

Fuel and power was discussed at the Labour conference on a motion moved by Mr. Ernest Jones, a leader of

the National Union of Mineworkers. He called for the adoption of a national policy designed to "secure the maximum use of indigenous fuel and to limit unnecessary fuel imports." After a short debate—in which the writer expressed the view that the Ministry of Power under its present leadership had turned out to be a tremendous disappointment — Mr. Sam Watson, also a miner, answered for the Executive. Accepting the motion, he said that they were in favour of appointing a committee to look at fuel and power policy, but he warned that their report would have to be frank. Unless the movement was prepared to raise the mining industry to the highest peak of efficiency there was no point in having a fuel policy at all.

At Blackpool, I see, Sir Peter Roberts, M.P., who speaks with personal authority on the steel industry, asked the conference "to view with alarm" Labour's policy of re-nationalisation. Since in that place there was obviously no dissent to such a proposition, the debate suffered from a paucity of contributions. However, Lord Mills, the Minister of Power, in replying to what there was, contended that ownership was now irrelevant to control in the public interest. The Labour claim that nationalisation of iron and steel was vital to the cause of economic planning made no sense. I think a Socialist would answer that this argument is ingenious, particularly coming from those who reject planning, but in that case does it really matter if the State is responsible for the investment? The truth is that the present argument about iron and steel is often unreal because all parties to it consistently misrepresent each other's point of view. It is presented as a choice between a nationalised monopoly and free enterprise when, in practice, Labour would leave the individual steel undertakings in existence and it was the Conservatives who set up the Iron and Steel Board which fixes prices.

Well there it is: these conference polemics were the first mutterings of a debate that will continue now with increasing loudness up to the General Election. My friends in industry should follow the issues because politics are a fact of life which conditions all we do. My friends at Westminster should remember also that whoever has the responsibility for government in the next few years can have little success unless there is a lively, efficient and forward-looking industrial and commercial system. Politicians—of all parties—and industrialists should, therefore, if they can't agree, at least try hard to understand the other man's point of view.

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Building Construction and Space Heating

I WAS interested to read the article on this subject in your issue of 3rd October, and fully support Mr. Ellarby's plea for more efficient thermal insulation in house building. But on thinking it over, I feel some comment is needed.

Not only does the unit cost of building construction such as walling vary considerably from one district to another, but the types of construction used tend to follow regional traditions. The 11in cavity brick wall is not "traditional," I doubt if it has been in general use for fifty years, and the custom of rendering it externally is local and confined to certain areas where this treatment has a long tradition behind it. External cement rendering frequently gives trouble and, as it is also an addition to the structure, it is generally omitted in favour of facing brickwork. An external rendering being essential on hollow clay building blocks used externally, this method of construction is rarely used.

I wonder if Mr. Ellarby has included the cost of the necessary two-coat rendering in his figures in Table 1, and whether he has checked the "U" value for this construction, which he gives as 0·16? The makers of these blocks quote U=0·21 for the same wall, obtained from tests carried out in conjunction with the Building Research Station: the data were published last year. All in all, I do not think this construction should be recommended for general use.

With regard to the ground-floor slab construction shown, the influence of local conditions is again apparent, and I am very doubtful about putting the insulation under the hardcore. The general requirement is that the hardcore should be well consolidated by rolling or other means before laying the oversite concrete. I hardly like to visualise what would happen to the glass fibre insulation under such conditions and on a soggy site.

There are many things to be considered, some far from obvious, when making general recommendations for improved building construction, and I hope Mr. Ellarby will be able to go deeper into the matter and let us have some further account of his experiences. At present I feel he is inclined to be too optimistic.

London, N.W.11. A. L. OSBORNE, F.R.I.B.A.

Private Generation and Public Supply

I SHOULD like to congratulate Sir Oliver Lyle on the excellent way in which he presented his article on "Electricity Tariff's Effect on a Sugar Refinery," but at the same time to point out that in his endeavour to follow his practice of recommending saving of fuel, he has overlooked several major points.

One obviously cannot disagree with the figures quoted on the cost of back-pressure power generation without seeing the complete calculations, but it would appear that no allowance has been made for depreciation and interest on the capital cost of the turbine and associated equipment. The paragraph on exported power mentions that the boiler make-up had previously been produced in a quadruple-effect still working from 250 p.s.i. to 70 p.s.i., whereas the first paragraph quotes the turbine as working at 650 p.s.i. If the boiler plant had to be replaced with equipment suitable for producing steam at 650 p.s.i. instead of 250 p.s.i. then obviously additional charges would have to be set against the cost of generation.

However, despite all the additions that one can envisage that should be made, there is no doubt, as I myself have also proved, that it pays to generate privately as against obtaining power from a supply undertaking, providing always that one uses back-pressure sets and that the particular system or process is capable of absorbing the

steam needed to generate the electrical power required.

In the latter half of his article Sir Oliver Lyle first shows how profitable to the nation the scheme is, but then tries to prove that it is cheaper to generate condensing at 1·4d/kWh than it is to buy power at approximately 1·3d/kWh $\left(\frac{216{,}750\times240}{6{,}000\times130\times51}\right.$ as shown in paragraph 2) from the London Electricity Board.

In conclusion, whilst I should like to see Sir Oliver Lyle prove his case in all circumstances I feel that it is unworthy of him to suggest that a national undertaking should subsidise a private body in such a manner as he implies.

Laindon, Essex. FRANCIS P. JEFFERIES.

Space Heating

I AM very pleased that Mr. Houldridge has seconded my appeal for more detailed information on the subject of continuous electric space heating. He does, however, make one point that if oil-filled electric radiators are to be tailored to suit individual windows, they must be "frightfully expensive" to buy.

Mr. Houldridge and your readers might like to know that for a long time we have emphasised in our literature that oil-filled electric radiators should be tailored to full window width and we are prepared to make them to a specific dimension at no extra charge whatsoever. In other words, you can buy a tailored radiator at the same price as you can buy one of our standard models provided the loading is the same.

With regard to running costs, I do hope that when the case for floor heating is considered, due account will be taken of the fact that almost invariably some means of topping-up is available to the occupants. For example, in most of the flats and homes in which electric floor heating has been provided there is almost invariably an electric fire for topping-up purposes during very cold weather. It would be interesting to know whether these electric fires that are used for topping-up come on at the peak or otherwise.

I hope some consideration will be given in experiments, to the possibility of coupling up water heating and space heating with an electric cooker.

What does surprise me is the comparative lack of interest in electric space heating by the industry as a whole. Generally, the feeling seems to be that electricity is all very well for switching on for twenty minutes while one has a bath or breakfast, and it would appear that people are still prepared to accept a very low standard of comfort in this country.

Surely one of the objectives of a higher standard of living must inevitably be a higher standard of comfort, and this must, in turn, mean continuous space heating—in other words people will become accustomed, as, of course, I am, to a continuously warm bathroom and a continuously warm living room.

London, W.1. A. C. HAZEL,
Managing Director,
Hurseal, Ltd.

IN your issue dated 17th October, you refer, on page 711, to electrically heated carpet underlays, and go on to say they are claimed to maintain a room temperature of 70 to 75 deg F.

Surely this should read floor temperature, and if so, the room temperature will be of the order of 55 to 60 deg F in favourable conditions.

"HELIOS."

[Our correspondent is right, of course. The reference should have been to floor temperature.—Editors, *Electrical Review.*]

NEWS FROM INDIA

From our New Delhi Correspondent

ACCORDING to the Central Water and Power Commission, the total electricity production in India in 1957 was 10,835 million kWh, of which 54·5 per cent was contributed by steam plants, 43·2 per cent by hydro plants and the remaining 2·3 per cent by diesel plants. The total installed capacity was 3,250 MW (steam plant 55 per cent, hydro plant 37 per cent, and diesel plant 8 per cent). The production was 13 per cent more than in 1956, when the output was 11 per cent more than in 1955.

The British left India in August, 1947, and the year 1957 thus marks the end of the first "free" decade 1948-57. At the end of 1947, the total installed capacity was 1,363 MW and total production 4,073 million kWh. There has thus been a rise of 140 per cent in installed capacity and of 165 per cent in total production. This gives a doubling period of about seven-and-a-half years which it is now hoped to improve to five years. These figures refer to electricity production in public utilities only; in addition, there are a number of industries which produce their own power. This is roughly of the order of 2,500 million kWh. The total electricity output in 1957 was, therefore, roughly 13,300 million kWh, that is, about 35 kWh per head. Ten years ago, in 1947, the figure was about 19 kWh. The only countries in South-East Asia having a lower *per capita* consumption are Ceylon, Pakistan and Burma.

Nineteen undertakings out of a total of over 700 contributed more than 88 per cent of the total production. About 40 per cent of undertakings have a production capacity of up to one million kWh annually and these together contributed less than one per cent of the production. The remaining 57 per cent generated only about 11 per cent of the total output.

The total capital expenditure by public utility undertakings up to the end of 1957 has been estimated at Rs.450 crores (about £338 million), which works out at about Rs.1,380 per kW installed, that is, about £100/kW. On the basis of the sales in major undertakings covering about 78 per cent of the total sales to the public, the average revenue per kWh is estimated at 1·15 annas (about 1·3d).

ATOMIC POWER IN CEYLON

The Minister of Industries of Ceylon, Mr. P. H. William de Silva, has been requested by the Government to recommend the measures that should be adopted for the implementation of an atomic power programme. This will be based on the draft report of the Working Committee on Atomic Energy of the National Planning Council, which has been approved by the Government. One of the main recommendations of the Committee is that the Government should take steps for the creation of a Central Atomic Energy Authority.

INDUSTRIAL NEWS

Electricity Supply Workers' Wages

At the meeting of the National Joint Industrial Council on 23rd October agreement was reached to increase skilled craftsmen's grades in the electricity supply industry by 1d per hour. When the claim was first put forward in December, 1957, the skilled grades were specified as: armature winder, blacksmith, fitter driver, electrician (telephone), electrical fitter, mechanical fitter, linesman (overhead power, 30 kV and over), meter repairer (mechanician), meter tester, turner, jointer (e.h.t.), welder, rigger (Grade 1) and instrument mechanic. The hourly skilled rate is now 5s 0½d (£11 1s 10d per 44-hour week) in London, and 4s 8½d (£10 7s 2d per 44-hour week) in the provinces, to which is added the productivity allowance of 8s 3d per week negotiated and agreed last June, but retrospective to 1st May last.

Compulsory Arbitration to End

Mr. Iain Macleod, the Minister of Labour, announced last week that the Government had decided to abolish the Industrial Disputes Tribunal. This body was set up during the war (in 1940) when strikes and lockouts were made illegal and the submission of intractable industrial disputes to the Tribunal became compulsory. The Tribunal was retained in 1951 when strikes and lockouts were no longer regarded as illegal. Since it was established the Tribunal has issued awards in 1,051 cases.

The Trades Union Congress wished the Tribunal to be retained in its present form but the British Employers' Confederation wanted certain alterations in procedure to which the T.U.C. could not agree. The Industrial Court to which problems of wages and conditions can be voluntarily referred will continue to function.

Rolling Mill Plant Contract

As part of the expansion programme for its Rogerstone Works, the Northern Aluminium Co., Ltd., has ordered from the A.E.I. Heavy Plant Division, Rugby, a number of large electric drives for rolling mills. The main mill unit in this programme is a new 144in 4-high reversing plate mill, the drive for which will comprise two 4,000 h.p. 30/60 r.p.m. d.c. motors forming a "twin drive." The combined cutout peak rating of these motors is 24,000 h.p. and the corresponding torque is 1,875 ft-tons, which exceeds that of any mill drive yet installed in Britain. The two motors are supplied from a flywheel motor-generator set driven by an 8,000 h.p., 11,000 V induction motor. Also included in the contract is all the electrical equipment for the slab shears, screwdowns, table rollers and other auxiliaries. The table rollers are driven by d.c. motors which are supplied from grid controlled mercury arc rectifiers. The control of these rectifiers is practically identical with that used for mercury arc rectifiers supplying reversing mill main drives.

The reversing mill is to be located at one end of the existing hot line. At the other end is a train of 4-high finishing stands, and this is being extended by the addition of a further stand and by increasing the capacity of the drive on an existing stand. This calls for the installation of two new 4,000 h.p. d.c. motors, and these will be fed from two 3,200 kW 675 V grid controlled mercury arc rectifiers, a further 2,080 kW 440 V rectifier being installed to supply an existing 2,600 h.p. mill motor. In addition to this main drive equipment for the finishing mill the Heavy Plant Division is supplying all the auxiliary drives, including a special hot coiler equipment. Most of the electrical equipment will be built at Rugby.

Engineering Training School

The new engineering training school of the British Tabulating Machine Co., Ltd., at Letchworth was formally opened on 7th October by the Hon. David Bowes-Lyon, Lord Lieutenant of Hertfordshire. Since an important part of the company's contracts is the servicing of their customers' purchased and rented equipment, both electro-mechanical and electronic, it is essential that a large number of experienced field engineers should be available at all times and the new school has been built to ensure that no shortage exists.

The school covers nearly 24,000 sq ft and includes fourteen classrooms and a large apprentice workshop. The building cost about £100,000 and the value of the Hollerith equipment which has been set aside for the training of students is £36,000.

Motor Control Gear for New Zealand

The Igranic Electric Co., Ltd., which recently secured an order for control gear for a freezing plant in Invercargill, New Zealand, has received another contract for a motor control centre for a sewage purification station in Christchurch, N.Z. The order was placed by the Christchurch Drainage Board through Igranic's New Zealand agents, Tolley & Son.

Awards at Brussels

Following our announcement last week of the awards to exhibitors in the British Industry Pavilion at the Brussels World Exhibition, we have been informed that the Birmingham Engineering Centre Group Stand, on which several electrical firms had equipment, gained a total of 28 awards. In addition to the gold medal already mentioned, these included a grand prix for "Refrigeration Methods and Equipment"; silver medals for "Distribution of Electrical Energy," "Construction of Generating and Distribution Equipment" and "Lighting"; and a bronze medal for "Domestic Uses of Electricity."

European Purchasing Federation

At a meeting in Düsseldorf on 18th October a European Federation of Purchasing (Fédération Européenne de l'Approvisionnement) was formed by the Purchasing Officers' Association (United Kingdom) and corresponding

Her Majesty the Queen visited the Dairy Show at Olympia, London, on 23rd October. She is seen here with Mr. R. A. Bayetto, on the stand of the British Electrical Development Association

organisations in Germany, France, Holland and Sweden. The objects of the Federation include the development and improvement of practice and science of purchasing; to provide a recognised body through which the purchasing function can be represented in international affairs; and to encourage and assist purchasing officers to set up and develop their own association in those European countries where such bodies do not yet exist.

The secretary is Mr. J. R. Blinch, secretary of the Purchasing Officers' Association, Wardrobe Court, 146a, Queen Victoria Street, London, E.C.4.

"Wireless World" Diary

The 1959 *Wireless World* Diary, which is now available, contains an 80-page reference section giving information on a variety of radio matters. This includes base connections for over 700 current valves, design data, addresses of radio organisations in this country and abroad, licence regulations and a good deal of other technical and general information. It is published in two bindings, leather (price 6s 3d) and rexine (price 4s 6d), plus 4d postage. The diary is published by T. J. & J. Smith, Ltd., 12, Hanover Square, London, W.1, in conjunction with *Wireless World*, Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1.

Laurence, Scott Exhibition

It is just 75 years since William Harding Scott built a dynamo at Norwich. This enterprise has now grown into the well-known company of Laurence, Scott & Electromotors, Ltd., which has three modern factories in Norwich as well as others at Manchester and elsewhere. When we visited Norwich last week we had the pleasure of seeing a permanent exhibition which the company has arranged at its Salhouse Road branch works to facilitate the demonstration of equipment to customers under actual running conditions. The exhibition includes both a.c. and d.c. equipment and various types of speed control for industrial and marine use. The working exhibits include a number of N-S variable speed a.c. motors arranged to show the various forms of speed control which are available. One is equipped with a pilot motor operated regulator, another with a hand operated regulator while the others have respectively a "joy-stick" regulator, tapped transformer control, "Velonic" electronic control and "Asrec" automatic control.

Another part of the exhibition is devoted to the "Altoreg" high performance alternator, the range of "Trislot" high torque, low current, squirrel-cage motors and the "Speedmaster" variable speed control applied to standard squirrel-cage motors.

Marine equipment is represented by the L.S.E. "A.c. Ship" which includes

Part of the permanent exhibition set up by Laurence, Scott & Electromotors, Ltd., at their Norwich works

typical auxiliaries of a ship with an a.c. supply. There are also various types of winch as well as a Ward Leonard speed control system. Scale models of about fifty examples of the company's range of machines are also on view.

Attached to the exhibition hall is a small cinema which is equipped for the showing of instructional and technical films.

Plastics Abstracts Service

Members of the British Plastics Federation were reminded by the chairman at their recent conference at Torquay of the Federation's service of abstracts from journals, covering practically the whole world, and patents of interest to all concerned in the manufacture or use of plastics. These deal with materials, processing methods, machinery and applications. The most important journals from which the abstracts are taken are available in the Federation library, 47-48, Piccadilly, London, W.1, to all subscribers, and copies of articles can be supplied intact in the original journal, or in photostat or microfilm form. The abstracts are available at a subscription of 10 guineas (post free) per annum, printed on both sides of the paper or on one only.

Electronic Aids for Sales Analysis and Retailing

During next year electronic equipment will be installed at the Nottingham offices of the Boots Pure Drug Co., Ltd., for sales and manufacturing data processing. The till rolls from cash registers, modified by the Norwegian firm of Jörgen S. Lien Industrier from the "Regna" type, will be read by an electronic reading automaton which has been developed by the Solartron electronics group. The output from this machine will then be fed into an analyser to provide information in printed form in the various ways needed for sales control.

An E.M.I. "Emidic" computer will also be installed to maintain a perpetual inventory of the 60,000 lines stocked in Boots warehouses, automatically controlling stock-holding and replacement. Orders will be sorted into warehouse bin sequence and requirements for items out of stock will be memorised and supplied when available.

Proposed Indian Cable Factory

An Indian firm tells us that it has been granted a licence for the starting of a cable factory in Madras and is desirous of securing quotations from manufacturers for plant for the factory. It particularly mentions a copper rod rolling and drawing plant with a capacity for dealing with 3,000 tons of copper a year; plant for producing weatherproof and v.i.r. insulated wires (600 tons a year); and a four-high cold rolling mill for copper and brass sheet (10 tons a day).

We should be pleased to pass on the firm's name to any manufacturers interested in quoting for this plant.

Engineering Opportunities for Women

A booklet, "Training and Opportunities for Women in Engineering," has been published by the Women's Engineering Society. The various courses which may be taken at universities and technical colleges are discussed, followed by a summary of the main branches of engineering and some of their sub-divisions which are of particular interest to women. Opportunities in the civil and military services are reviewed and the booklet concludes with a summary of the grades of post open in design and research. The book, price 3s 6d, is obtainable from the Society at 25, Foubert's Place, London, W.1.

Industrial Health Conference

On 26th November a one-day conference on industrial health will be held at the Queen's Hotel, Piccadilly, Manchester. Organised by the Industrial Welfare Society, in conjunction with the Nuffield Department of Occupational Health at Manchester

University, it is planned to interest not only industrial medical officers and nurses, but also personnel and welfare staff and other industrial executives. Professor R. E. Lane, Nuffield Professor of Occupational Health, University of Manchester, will open the conference and a critical evaluation of medical examinations will be presented by Dr. D. Malcolm and Miss M. Wilmore, medical officer and chief personnel officer respectively, of Chloride Batteries, Ltd. The fee for the conference is £2 2s per delegate, or £2 10s for delegates from organisations that are not members of the Industrial Welfare Society.

South Africa Adopts "Centenary Neophone"

The South African Posts and Telegraphs Department has adopted the Siemens Ediswan "Centenary Neophone" as the standard telephone instrument for subscribers throughout the Union. This instrument supersedes the original Siemens "Neophone" introduced a quarter of a century ago. Siemens Edison Swan, Ltd., has also received orders from Gibraltar, Hong Kong, Nigeria, Sudan, Venezuela, the Near East and SHAPE.

Cast Iron Research

The thirty-seventh annual report published by the Council of the British Cast-Iron Research Association gives details of the research carried out and the activities of the foundry operations section and intelligence department in 1957-58. The illustrated report is obtainable from the offices of the Association at Alvechurch, Birmingham.

Works Visit

The Technical Committee of the Electric Light Fittings Association was entertained earlier this month by the Telephone Manufacturing Co., Ltd. After lunch at Chislehurst, the party was taken by senior components and production staff on a tour of the various sections of the St. Mary Cray factory. Considerable interest was shown, particularly in the wide range of capacitors in production for all branches of industry, including the lighting industry. The new impregnation plant, designed by T.M.C. and built partly in this country and partly on the Continent, was also visited.

Packaging of Electrical Components

A new range of containers, specially designed to hold delicate electrical components, is now being manufactured by Miday Plastics, Ltd., 34, Hoxton Square, London, N.1, using Distrene X expanded polystyrene. The containers are light and are moulded to suit individual components. No additional packing is required to hold them in place. Internal struts and ledges are moulded in so that the article being carried fits snugly inside its container.

SIMA Convention

The seventh annual convention of the Scientific Instrument Manufacturers' Association will be held at the Hotel Majestic, Harrogate, from 6th to 9th November. Four convention panels representing the iron and steel, oil and chemical, textile and fibre, and fuel and power industries will meet under the chairmanship of an executive from a member firm to discuss laboratory and plant instrumentation, instruction manuals, installation and servicing, future trends and automation. Experts will be present to give accounts of the needs and problems of their particular industry. Full details of the convention are available from the secretary of the Association at their instrument centre, SIMA House, 20, Queen Anne Street, London, W.1.

Instrument Leaflets

The manufacturers of "EEL" photoelectric instruments have published a series of leaflets entitled "Instruments in Industry," each offering a comprehensive guide to the analytical determinations which can be achieved by those instruments applicable to the trade or industry covered. Detailed method sheets for use with the "EEL" absorptiometer, the "EEL" flame photometer and the "EEL" colorimeter have also been produced. Both can be obtained free on application to Evans Electroselenium, Ltd., Colchester Road, Halstead, Essex.

Tricity Cookers, Ltd., has produced two new display units for its "Popular" and "Viscount" cookers. This picture shows the new "Viscount" display

Decoration Lighting Sets

Crompton Parkinson, Ltd., has introduced a new "Jewel Reflector" decoration lighting set with transparent lacquered coloured glass lamps. The added sparkle of the twelve coloured lamps coupled with the richly coloured translucent petal shaped reflectors enable many attractive combinations to be introduced for decorative effect. An eye catching pack contains 12 lamps in assorted colours, with one

Members of E.L.F.A. at the T.M.C. Works. Standing (left to right): Messrs. R. W. Sayers (Rowlands Electrical Accessories, Ltd.), D. A. Hart (G.E.C.), W. F. S. Debenham (G.E.C.), D. C. Pritchard (Falk, Stadelmann & Co., Ltd.), A. S. Coleman (G.E.C.), E. M. Shepherd (assistant secretary, E.L.F.A.), J. H. Studholme (Benjamin Electric, Ltd.), H. J. Beach (T.M.C.), A. R. Clifford (T.M.C.) and P. Percival (T.M.C.). Sitting (left to right): Messrs. R. A. Hounslow (Falk, Stadelmann & Co., Ltd.), J. H. Campion (secretary, E.L.F.A.), P. Hartill (Revo Electric Co., Ltd.), C. B. Charlton (T.M.C.), G. A. Mogford (Crompton Parkinson, Ltd.) and S. Anderson (G.E.C.)

The new Crompton Parkinson "Jewel Reflector" decoration lighting set

spare, which are ready wired in series with green p.v.c. flexible wire in loop construction and fitted with a b.c. connector.

A "Standard Set" which has twelve ready wired, assorted coloured cone-shaped lamps, with the spare, is again available as well as the popular packs of twelve spare coloured or clear lamps.

A set of miniature size "Osram" coloured bulbs which will give a "new look" to party decorations during the coming festive season is now being marketed by the G.E.C. The new "Lilliput" set comprises 40 miniature 6 V 0·75 W bulbs in red, yellow, blue, green and clear. The capless bulbs are easy to insert into the coloured plastic holders which are fully insulated and protected for maximum safety. An automatic internal cut-out in each bulb ensures that if one or more bulbs fail the remainder stay alight. The price of the set is £2 5s (including 4s 2d purchase tax); spare bulbs cost 8½d each (including 1½d purchase tax).

The glass bead which serves to locate the filament support wires in these miniature bulbs is automatically treated with a specially-developed compound during manufacture. Under normal operating conditions, where the potential across the filament supports is about 6 V, the coated bead has a high resistance. If the filament of any one bulb fails, however, the p.d. across the supports in that bulb becomes equal to the mains voltage, and the film across the bead undergoes an immediate change to a very low resistance state. The circuit is thus completed and the remainder of the bulbs stay alight.

The new Osram "Lilliput" decoration set

Electrical Equipment of the "Pendennis Castle"

The Union Castle's new passenger-mail liner *Pendennis Castle*, built by Harland & Wolff, Ltd., Belfast, is fitted with navigational and communication aids supplied by Siemens Edison Swan, Ltd. In addition to engine room, boiler room, docking and steering telegraphs, there is a torsion-meter on both shafts, two revolution indicators, a rudder indicator and power failure alarm indicator. Loud-speaker telephones are fitted in various parts of the ship, and these include new docking telephones incorporating transistorised amplifiers. There is also a ship's automatic telephone exchange of 45 lines.

Electric Cranes for Regent's Canal Dock

British Waterways has placed an order with Thos. Smith & Sons (Rodley), Ltd., Rodley, Leeds, for three electric 3/6-ton quay cranes for use at "D" and "F" Quays, Regent's Canal Dock, London, in replacement of existing obsolescent hydraulic equipment. The new cranes, for which quay-length tracks will be provided, will have 65ft jibs to facilitate overside working to barges.

Compressor Lubrication

"Compressors and Vacuum Pumps and their Lubrication" is the title of a book recently published by the Shell Petroleum Co., Ltd., copies of which are available in the United Kingdom from Shell-Mex & B.P., Ltd., Shell-Mex House, Strand, London, W.C.2. In addition to various aspects and principles of lubrication the book deals with constructional and similar features of various types of equipment.

G.E.C. in Ireland

The decision to form a new company, with the title of the G.E.C. of Ireland, was mentioned by Mr. Leslie Gamage, chairman and managing director of the General Electric Co., Ltd., at the 21st anniversary dinner of Aibhlisi Eireannacha Teoranta (A.E.T.) held recently in Dublin. Mr. Gamage said that the G.E.C. intended, as soon as possible, to combine its Irish selling branch and the A.E.T. factory into one company. The G.E.C. already had an investment of something like £500,000 in Ireland and since it bought the factory in 1947 the output had increased from £37,000 to nearly £600,000 to-day. The G.E.C. recognised Ireland's need for exports and it was arranging that a number of A.E.T. products would be exported, not only to the G.E.C. in the United Kingdom, but also to its organisation all over the world.

Trade Announcements

Wickman, Ltd., has acquired a majority holding in Brasmac Industria e Comercio S/A, Sao Paulo, Brazil, with a view to furthering the Wickman group's exports to, and expanding its tungsten carbide interests in Brazil.

C.A.V., Ltd., announces that its eastern area has been enlarged and extends from Lincolnshire to Essex. Mr. G. H. Wolno, area manager, will now operate from Cambridge. The south-eastern area, originally divided into North Thames and South Thames regions, is now reconstituted into an area comprising the Home Counties plus Hants, Sussex, Oxfordshire and Berkshire, with headquarters at Brighton, and a London area comprising the Metropolitan Police District with headquarters at Acton. Mr. D. J. Thomas is area manager for the south-eastern area, and Mr. J. E. Liardet is area manager, London area.

It is announced that "Presto" automatic electrical appliances are now handled direct from the manufacturers, the **National Pressure Cooker Co. (England), Ltd.,** Fort Works, Pelham Street, Wolverhampton.

Hellermann, Ltd., has been appointed sole agent in Great Britain for the range of "Suprafix" spring-loaded terminal blocks manufactured by Wago-Klemmenwerk G.m.b.H.

Gresham Developments, Ltd., the specialist company of the Gresham Transformer Group, Ltd., has moved to new premises at Thurlestane House, Uxbridge Road, Hampton Hill, Middlesex (telephone: Molesey 4540, 6211, 3059).

Associated Electrical Industries, Ltd., has moved from Crown House, Aldwych, to 33, Grosvenor Place, London, S.W.1 (telephone: Belgravia 7011).

Mr. L. E. F. Burdett is the new public address representative for the North East Region of **Philips Electrical, Ltd.** He was previously with the Carborundum Co., Ltd., Manchester.

With the lifting of dollar import restrictions, the full American range of Duff Norton jacks is now available from the **Consolidated Pneumatic Tool Co., Ltd.,** 232, Dawes Road, London, S.W.6, in addition to the models now being manufactured in the United Kingdom. Some 200 jacks are available in this range.

The **Hepworth Iron Co., Ltd.,** has moved its London office to 116, Canbury Park Road, Kingston-upon-Thames (telephone: Kingston 9884/5), where it will be establishing a depot for the distribution of armour bonding and other engineering accessories.

OVERSEAS ELECTRICAL TRADE

Continued Decline in Exports During September

THE downward trend in the value of British electrical exports this year was continued last month, and the total for the first nine months of the year of £165·3 million was some £7 million lower than for the corresponding period of 1957. The month's total of £14·9 million was £3·5 million below the preceding month's figure and £2 million less than for September last year. The most noticeable declines were in the heavy electrical machinery classes and in radio and associated equipment. In the generating sets, motors, etc., group the fall as compared with the preceding month was £1·3 million and also about £700,000 as compared with September last year. Exports of converting machinery, mercury-arc rectifiers, transformers, etc., fell by £650,000 as compared with the previous month, and by about £700,000 as compared with September, 1957. The value of exports of radio equipment was nearly £900,000 below the August figure, and £550,000 less than for September last year. The demand for telegraph and telephone material remained steady, and the cables and wires group improved slightly as compared

TABLE I.—ELECTRICAL EXPORTS

Class	Month of Sept., 1958	Nine months ended 30th Sept., 1957	Nine months ended 30th Sept., 1958
	£	£	£
Generating sets and generators:			
Diesel-driven, up to 10 kW	112,908	1,304,407	1,057,765
Ditto, 10 to 65 kW	137,418	1,498,426	1,796,015
Ditto, 65 to 200 kW	126,674	1,067,249	1,757,770
Ditto, over 200 kW	168,050	2,868,119	3,758,861
Spark ignition engine driven	8,540	157,702	151,480
Steam turbine driven	6,709	647,381	682,004
Hydraulic turbine driven	—	79,167	17,542
Other prime mover driven	914	230,164	156,422
Generators, not exceeding 200 kW	146,546	1,421,263	1,194,261
Ditto, over 200 kW	17,647	1,180,509	890,284
Parts of generators	434,428	3,294,257	5,915,843
Motors, complete, other than railway, tramway and trolley-bus:			
Up to ½ h.p.	122,545	1,727,532	1,360,376
Over ½ but under 1 h.p.	31,947	424,714	438,481
1 h.p. to 250 h.p.	330,527	4,266,319	4,032,427
Over 250 h.p.	84,270	1,232,300	1,025,539
Railway, tramway and trolley-bus motors complete and parts of all motors	209,198	1,869,190	1,903,014
Motor starting and controlling gear	179,646	2,953,929	2,264,864
	2,117,967	26,222,628	28,402,948
Converting machinery	14,530	436,644	258,193
Mercury-arc rectifiers	43,617	1,066,669	957,609
Transformers for lighting, heating and power (incl. coils):			
Not exceeding 7,500 kVA	398,037	5,511,806	5,506,513
Over 7,500 kVA	220,071	2,520,785	3,770,189
Switchgear and switchboards (not telegraph or telephone), up to 200 A and 660 V	283,952	3,211,893	3,606,213
Ditto, other	842,224	10,706,980	8,982,669
	1,802,431	23,454,777	23,081,386
Primary batteries:			
Lighting	91,833	898,739	799,584
Radio	280,228	2,210,615	2,657,615
Other	35,757	378,052	411,421
Parts (excl. carbons)	45,036	501,007	422,252
Lamps:			
Filament, exceeding 28 V	73,244	814,573	740,310
Ditto, under 28 V	24,926	264,365	262,038
Arc lamps and searchlights	20,453	115,552	161,567
Discharge lamps, fluorescent tubes, etc.	78,833	827,132	763,503
Radio and television, etc., apparatus:			
Thyratrons, hot cathode mercury vapour and gas-filled rectifiers (excl. mercury arc rectifiers), photo-electric cells, stabilising and cold cathode valves, magnetrons, klystrons	20,706	208,389	243,347
All other	407,112	2,584,867	3,238,442
Parts (excluding glass bulbs)	15,879	112,589	184,438
Radio and television transmitters	2,007	509,339	231,018
Commercial radio and radar equipment	810,055	11,590,792	10,495,015
Domestic radio receivers, mains	91,347	989,276	749,601
Ditto, battery	36,188	492,957	456,870
Ditto, other (incl. car)	16,101	246,678	192,919
Radiograms	31,586	283,898	293,235
Television sets	51,626	481,982	811,824
Public address equipment	81,825	836,830	816,267
Other radio and television apparatus, n.e.s.	27,921	374,329	266,884
Components and parts, n.e.s.	600,701	7,130,491	6,712,504
	2,193,054	25,842,417	24,692,364
Telegraph and telephone installations	612,160	6,590,145	6,656,461
Telephone instruments, separately consigned	84,443	1,379,982	1,489,443
Telegraph and telephone parts	812,060	7,158,405	7,016,911
Line apparatus for long distance communication	174,150	1,821,869	1,589,500
	1,682,813	16,950,401	16,752,315

Class	Month of Sept., 1958	Nine months ended 30th Sept., 1957	Nine months ended 30th Sept., 1958
	£	£	£
Cookers	76,670	561,595	521,921
Toasters	48,472	179,470	211,753
Other cooking apparatus	32,469	289,248	297,224
Parts and accessories	71,034	586,406	537,301
Space heating appliances	27,122	285,823	277,865
Water heating appliances	17,335	286,828	235,944
Other heating appliances	17,704	313,282	272,310
Parts and accessories	70,658	499,185	593,779
Irons	79,136	669,429	669,068
Arc welding equipment, a.c.	38,448	460,253	433,025
Ditto, d.c.	35,513	391,541	704,931
Resistance welding equipment	6,229	192,785	126,304
Electric furnace plant	35,439	723,510	878,514
Magnetos, ignition	12,734	198,965	130,760
Sparking plugs	149,708	1,425,191	1,349,161
Elec. appliances for aeroplanes, n.e.s.	247,084	2,397,694	2,489,805
Ditto, for motor vehicles, n.e.s.	343,195	3,083,152	3,385,306
Ditto, for cycles, n.e.s.	43,258	520,208	461,169
Signalling app. (incl. traffic signals)	76,179	1,059,220	1,215,077
Instruments, commercial	161,575	1,535,941	1,566,454
House service meters (including parts)	129,983	1,287,904	1,299,041
Electro-medical apparatus (not X-ray)	77,218	351,409	489,423
X-ray apparatus (excl. tubes and valves)	37,590	650,939	490,360
Vacuum tubes	38,472	384,537	419,206
Ceiling fans, complete	60,319	1,021,649	941,214
Desk fans, complete and parts of desk and ceiling fans	38,647	353,519	287,979
Vacuum cleaners	126,202	1,322,136	1,128,754
Floor polishers	65,970	782,797	606,604
Food mixers	59,673	451,416	501,527
Hair clippers and dry shavers	28,108	631,323	472,055
Other portable appliances	18,369	240,407	160,910
Parts	96,754	1,216,496	954,133
Portable elec. tools (not saws) and parts	169,631	1,931,277	1,863,944
Cables and wires:			
Telegraph and telephone, submarine	91,962	4,190,045	625,997
Ditto, other	473,718	8,605,720	4,682,789
Cotton, silk or art. silk insulated	34,074	331,720	383,932
Enamel, glass or asbestos insulated	90,166	823,972	869,266
Paper insulated	507,868	6,970,758	5,918,998
Rubber insulated	353,373	4,882,286	4,012,100
Thermoplastic insulated	156,362	1,689,974	1,716,486
Other	184,621	1,551,723	1,956,474
	1,892,144	29,046,198	20,166,042
Accumulators for motor vehicles	101,747	1,392,015	1,396,819
Ditto, traction	13,458	250,221	174,333
Ditto, radio and other portable	38,007	600,212	536,584
Ditto, other	23,923	298,587	292,423
Parts and accessories	65,616	750,179	848,766
Electric wiring accessories	148,883	504,818	1,549,076
Elec. porcelain, etc. (incl. insulators), n.e.s.	80,363	912,188	938,943
Insulating cloth and tape	39,466	503,437	440,418
Other insulating material	94,161	846,869	883,383
Permanent magnets	35,334	459,439	437,988
Radio, telegraph and telephone testing equipment, n.e.s.	75,964	573,615	615,649
Scientific elec. instruments (not telegraphic or telephonic):			
Time recorders and time switches, complete	23,873	103,592	274,543
Other	407,842	2,718,003	3,234,415
Electrical machinery, n.e.s.	125,193	842,436	740,444
Electrical apparatus and appliances, n.e.s.	799,122	7,730,197	7,606,212
TOTAL	14,948,569	172,297,799	165,256,162

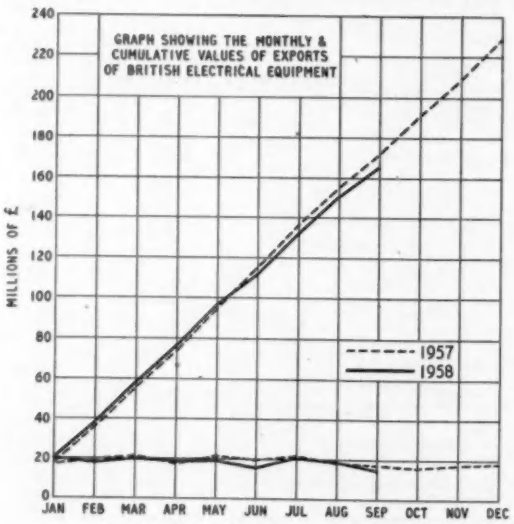
TABLE II.—DISTRIBUTION OF EXPORTS OF ELECTRICAL MACHINERY, APPARATUS AND APPLIANCES

Country	Month of Sept., 1958	Nine months ended 30th Sept., 1957	Nine months ended 30th Sept., 1958
	£	£	£
Channel Islands	120,085	805,986	1,044,871
Gibraltar	11,405	157,434	251,150
Malta and Gozo	34,247	511,819	554,869
Cyprus	48,001	1,156,280	676,869
Sierra Leone	33,867	318,174	514,304
Ghana	97,384	1,534,819	1,339,639
Nigeria	307,197	2,451,687	3,245,040
Union of South Africa	1,250,687	13,200,880	14,438,220
Rhodesia and Nyasaland	368,595	4,491,099	3,868,138
Tanganyika	32,963	674,643	417,719
Kenya	93,489	2,118,083	1,170,452
Uganda	23,484	752,450	491,095
Mauritius	24,467	321,146	335,322
Aden	35,429	413,575	475,378
Bahrain, Qatar and Trucial States	108,445	1,321,648	844,594
Kuwait	137,500	2,581,693	1,489,013
India	1,172,784	17,338,935	13,611,896
Pakistan	145,175	2,337,289	1,995,466
Singapore	452,816	2,996,269	2,873,153
Federation of Malaya	160,748	2,549,345	2,535,141
Ceylon	115,559	1,320,281	1,407,449
British North Borneo	12,756	217,433	169,194
Sarawak	11,196	202,105	207,549
Hong Kong	267,676	2,260,111	2,574,136
Australia	1,186,679	15,349,959	14,140,620
New Zealand	786,907	8,583,846	10,033,511
Fiji	15,222	156,355	238,478
Canada	1,112,172	9,791,997	10,468,004
Jamaica	155,624	962,104	1,237,304
Barbados	21,876	157,414	230,709
Trinidad	60,573	996,033	1,000,003
British Guiana	27,570	381,163	588,494
Other Commonwealth countries	95,367	1,031,977	1,372,746
Irish Republic	292,623	1,990,644	2,531,277
Soviet Union	94,705	1,726,475	448,701
Finland	104,759	1,226,943	1,045,057
Sweden	254,740	3,538,205	3,968,370
Norway	194,806	1,990,306	1,851,456
Denmark	199,815	1,661,279	1,696,945
Poland	62,380	391,545	632,892
Western Germany	320,735	1,868,274	2,552,191
Netherlands	628,777	6,029,862	5,477,781
Belgium	206,115	2,781,620	2,342,673
France	249,493	3,305,135	2,977,946
Switzerland	214,277	1,097,500	1,512,689
Portugal	172,088	2,517,652	2,600,055
Spain	85,889	3,174,985	1,355,405
Italy	261,909	3,026,999	2,490,709
Austria	54,511	357,186	405,753
Yugoslavia	10,064	485,119	580,798
Greece	63,203	1,117,954	730,838
Turkey	159,307	619,255	958,786
Belgian Congo	38,309	408,435	331,180
Portuguese East Africa	13,508	260,242	199,407
Egypt	24,317	45,842	875,769
Libya	33,231	309,540	518,257
Southern Morocco	44,527	320,815	336,241
Sudan	88,575	946,938	854,365
Syria	21,399	258,571	249,674
Lebanon	16,766	393,410	409,319
Israel	88,249	538,802	881,678
Jordan	32,427	492,949	576,856
Saudi Arabia	66,764	430,968	687,775
Iraq	237,622	2,243,137	2,516,506
Iran	185,365	3,194,991	3,059,674
Burma	64,437	890,088	629,505
Thailand	46,497	802,805	1,057,325
Indonesia	24,357	441,091	258,493
Japan	13,596	660,133	409,426
United States of America	469,383	10,393,142	5,814,034
Cuba	52,520	561,731	642,237
Mexico	44,930	507,981	433,994
Colombia	27,608	495,071	303,877
Venezuela	312,344	2,694,016	3,607,889
Peru	46,093	510,674	382,347
Chile	54,286	390,599	452,618
Brazil	74,719	883,894	838,679
Uruguay	7,837	200,964	40,369
Argentine Republic	216,649	1,159,370	3,310,955
Other foreign countries	444,113	3,510,630	3,576,865
TOTAL	14,948,569	172,297,799	165,256,162

with August, although exports were still £300,000 less than for September, 1957.

The leading market for generating sets in September was Canada, which purchased plant valued at £312,027, the next in order of importance being Australia, with £153,403; India, with £147,429; and South Africa, with £142,925. South Africa took the lead in purchases of converting machinery, mercury-arc rectifiers, etc., with a total of £367,380, and India held second place with £300,977.

The Netherlands continued as the best market for radio and associated equipment, importing goods valued at £262,572. Among the Commonwealth countries, India took equipment valued at £132,551 and Australia made purchases of £121,428. Canada (£238,044), Australia (£234,521), and New Zealand (£225,410), were the principal markets for telegraph and telephone material.



India, with purchases of £291,046, and Singapore (£262,710) were the best Commonwealth markets for electric cables and wires. Exports to the United States, which were valued at £222,831 in September last year, were only £30,179 last month.

The value of exports of the various classes of equipment are shown in Table I, and their distribution in Table II. In addition to these goods other electrical equipment shown in the Board of Trade returns includes the following:—

Electric locomotives: September, £181,561; nine months, January-September, £2,510,355 (against £2,951,358). The figures for the month for locomotives with i.c. engines and electrical transmission are not given.

Electrically-operated washing machines, complete, not exceeding 150 lb net weight: September, £293,978; nine months, £3,078,282 (£2,468,934). Ditto, 150-250 lb: September, £66,652; nine months, £706,053 (£888,406). Parts: September, £95,913; nine months, £678,804 (£528,749).

Welding electrodes: September, £91,287; nine months, £1,045,038 (£1,062,451).

Electric conduit tubes and cased tubes: September, £54,838; nine months, £518,714 (£661,796).

Electric carbons (including parts): September, £47,913; nine months, £462,700 (£492,009).

Electric lighting fittings and lanterns (excluding arc lamps, searchlights, and lamps for road vehicles): September, £240,792; nine months, £2,513,577 (£1,838,942).

Other electric lighting appliances (excluding vacuum tubes and lamp bulbs) and fittings and parts, n.e.s.: September, £14,748; nine months, £387,064 (£2,070,797).

Electrical imports during September, at £2,274,036, were slightly higher than in the preceding month, and also a little above the figure for September, 1957. The total for the first nine months of the current year of £21,190,538, compares with £19,419,835 for the corresponding period of last year.

Performance of Telephone Systems

Authors' summary of papers on "Rating of Speech Links and Performance of Telephone Networks" and "Assessment of Speech Communication Links" which were presented to the Radio and Telecommunication Section of the Institution of Electrical Engineers on 27th October

By J. SWAFFIELD, Ph.D., B.Sc.(Eng.), M.I.E.E., and D. L. RICHARDS, B.Sc.(Eng.), A.M.I.E.E.

MOST large engineering equipment or plant is designed to performance specifications some at least of whose substance is expressed in units of measurement ("measures") which are both purely objective and whose meaning is substantially universal and absolute—such things as speed and acceleration of vehicles, horse-power of motors, cubic feet per hour of processing plant or tons lift of cranes. These "measures" thus tend to become the common ground in discussion between designers and users—the places where operational expression of "what is wanted" and the technical details of "how it can be provided" are ultimately connected together.

These conceptions, simple as they are, prove difficult to apply to the transmission aspects of telephone systems and this type of common ground between designers and users proves to be rather elusive. The smallest units of plant whose performance is worth discussing with users are single user-to-user speech connections (usually called "speech links"); it is surprisingly difficult to get much nearer to a useful performance specification than, say, "all speech links formed within the system should be satisfactory for ordinary conversation."

In spite of the endeavours of most telephone administrations and such bodies as C.C.I.T.T. (the body responsible for international aspects of civil telephony) no single widely satisfactory, much less universal or absolute, measure of the transmission performance of speech links seems to be practicable. Experience has shown that the more nearly a method of measuring performance comes to being of practical use to a designer, the less meaningful and less reliable it is as a measure of performance from a user's point of view; even a method so apparently favouring the user's outlook as "percentage of spoken words understood by a listener" is an extremely untrustworthy indication of conversational merit. All this does not mean that objectively framed clauses do not exist for individual components (e.g. telephone sets, exchange equipment, cables) of the overall link; the difficulty lies in relating the specifications of such elements to the performance of the link as it affects the user.

The difficulty springs from the fact that human beings, who form the ultimate terminations of every speech link, prove notoriously unreliable in their preferences and, in a scientific sense, inarticulate when it comes to assessing equipment, etc., which impinges on their own highly specialised skills and sensory processes. Speech itself,

Fig. 1.—Transmission standard

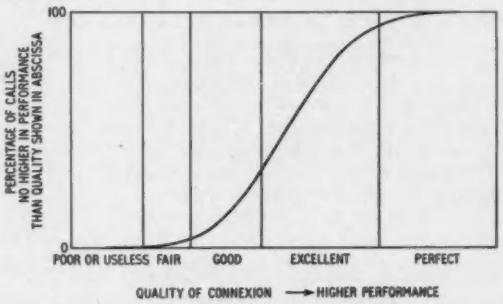


Fig. 2.—Distribution of call quality in a typical public telephone network

and especially *conversation* (which involves the speaking, listening and mental processes of two people), is a fairly extreme example of such a process. No reliable absolute measure exists for describing directly the extent to which a link impairs normal conversations, and practical assessment methods are used indirectly, that is as a feature of tests whose purpose is essentially comparative; such tests rate one link as so many units better or worse than some other link which is set up to provide a transmission standard.

By the use of "Standard" links and refined assessment methods to effect comparison with them, ratings useful for design purposes can be derived. The "Standard" links can be chosen to have a known reputation in operational service and so they do themselves perform, albeit somewhat indirectly, the essential connection between designers and users. A typical transmission "Standard" is shown in Fig. 1. All difficulties are aggravated by the fact that there is a wide range of more or less uncontrollable ambient conditions under which telephone calls are made in a working system.

The design aim for a system or network as a whole can only be stated statistically. A very large proportion (but it cannot be 100 per cent) of calls made should attain at least a rather low, just adequate, level of minimum performance; a somewhat smaller proportion should cross a boundary into a higher performance class and a smaller proportion still should cross a further boundary into a very high performance class. Without going into further detail here we may attach the labels "poor or useless," "fair," "good," "excellent," "perfect" to such classes of call. The distribution of call qualities will thus be of the kind shown in Fig. 2.

We shall return to the

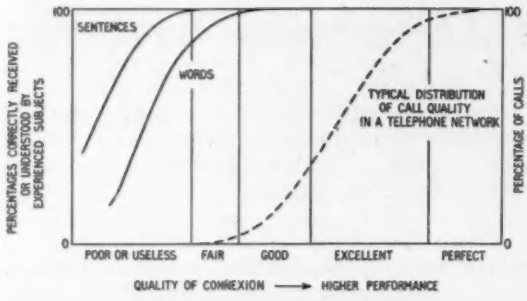


Fig. 3.—Assessment of score with experienced subjects as a function of the quality of the connection

problems of system or network performance later, but first let us seek an assessment technique on the restricted basis that it must provide a laboratory method, using human subjects, suitable for determining ratings relative to a "Standard" and that it must also define and locate meaningful class boundaries of the type used in Fig. 2. The use, as the assessment measure, of such quantities as "fractions of words or sentences correctly received" though at first sight very attractive proves impracticable if only because the range of practical speech links needing assessment is much greater than the range that can be discussed in terms such as percentages of words or sentences correctly received in any practical test; Fig. 3 illustrates the difficulties. It will be seen that both "sentence" and "word" percentages are virtually 100 per cent over a large part of the range of call quality relevant in a telephone system.

Devising tests to cover the wide range of performance needed is a major difficulty and is tackled by using a sequence of tests, each appropriate over only part of the range. Relatively good links may be assessed by "one-way" (no return speech path) methods because they do not in use cause their both-way aspects to be exploited; they would give rise to only rare queries or cross-questioning (which call for a return speech path) to understand what was said. Even so, subjects experienced in one-way testing yield such high "scores" that the results are of little practical use. Samples of ordinary men and women not interested in the speech studies themselves must be used and any given person must not be used at all frequently (no more than a few times a year).

A typical one-way task is for the subjects to listen to recordings of short sentences and to indicate which of five carefully defined categories of listening effort they consider necessary to understand their meanings. Speech links whose transmission is not sufficiently excellent for isolated sentences to be appreciated without any mental effort need to be treated throughout as both-way links and demand more elaborate experimental techniques.

It is true that measurements made in these ways are influenced as much by the performance of subjects as by equipment variables, but this is unavoidable as a speech link cannot, in general, be regarded as performing in a representative manner until it includes its two subjects or users. The difficulty is surmounted in two ways: the first is to exploit techniques of experimental design and statistical analysis developed in agricultural and biological work where very variable experimental material is also encountered. The second is the use, already mentioned, of "Standard" links assembled from equipment genuinely representative of plant in service. Assessment methods, when used for rating links, are so conducted that the link, connection, etc., under test is rated as being so much better, or worse, than the "Standard." It is of the greatest importance to realise that ratings are *not* in terms of assessment measures themselves, such as the left-hand ordinate scale of Fig. 3, but are in terms of units based on important design parameters, such as attenuation or signal/noise ratio, needed to make the equipment being rated equal in transmission performance to the "Standard."

Once confidence and experience have been gained with the general assessment method in some specific context, then rating based on much simpler comparison methods may be tried in that context. This is specially true where there are no new types of components likely to impair the speech quality in unpredictable ways. As an extreme example of this the vast bulk of detailed telephone planning data (for exchanges, local lines, etc.) are now commonly based on purely objective pure-tone electrical transmission measurements; such methods may be used provided it has been proved that they give results consistent with the more general but rather complicated methods discussed earlier.

By the use of ratings for all the numerous elements and factors that affect transmission a complete transmission plan can be built up with the object of ensuring that more or less all connections are reasonably satisfactory as conversational links. From this plan together with figures for the distribution of traffic over the system an estimate of the performance of the system as a whole can be made in the terms used in Fig. 2. Very much simplified, the result of such an estimate is shown in the table. It will be seen, first, that although combinations of unfavourable circumstances *can* produce calls of unsatisfactory ("poor or useless") transmission the many factors that have to be simultaneously adverse make the chances of this very small and, second, and much more surprisingly, nearly all unsatisfactory calls occur where factors (such as room noise, deafness or conversational incompatibility of the users) not under control of the telephone administration, rather than equipment factors, are dominant in operating unfavourably. For example, the 3,200 unsatisfactory calls where the equipment, etc., is most favourable (among calls of type A) in the table compare with only 60 unsatisfactory calls (of type C) when the equipment factors are moderately adverse and (on average) less than a single unsatisfactory call (of type E) when they are at their most adverse.

Finally, as is the case with any equipment for use by ordinary members of the general public, the final arbiter should be the user himself. "Is the equipment satisfactory for his particular uses?" This would, in any competitively produced item, be reflected in sales, but there are other channels of communication from the user to the designer such as market survey procedures, opinion polls and, of course, complaints. Results through all these should be allowed to influence (broadly by adjustments

ESTIMATED PERFORMANCE OF A TELEPHONE NETWORK: DISTRIBUTION OF CALLS OF VARIOUS LEVELS OF TRANSMISSION QUALITY

Type of call (see note)	Approx. number of calls per week	Number of calls whose transmission is:			
		Perfect or excellent	Good	Fair	Poor or useless
A	1,600,000	1,424,000	96,000	77,000	3,200
B	26,600	17,020	5,850	3,460	270
C	2,000	1,000	600	340	60
D	700	330	223	126	21
E	4	Less than 1	2	1	Less than 1

Note.—The five types of call A to E all concern long distance trunk traffic and represent respectively increasingly unfavourable routings through transmission plant and equipment. Thus A represents the vast bulk of such traffic which encounters only a few trunk links and switching points while E represents calls between extreme "tails" of the network where not only the maximum number of trunk links and switching points are encountered but both subscribers are connected to their local exchanges by the longest permissible lines.

to the transmission " Standards " used) the performance to which the network is designed. Telephone networks can be changed only slowly, but this can be made to affect the long-term trend of service offered to the user.

It will be seen that with its long time scale and only gradually changing plant the development of a large system may accurately be envisaged as evolutionary; this is emphasised by the sense in which the " Standard " represents the thing that has " survived because it works " and relative to which all improvements and adaptations are measured.

By the use of the methods described telephone networks can be designed and extended on a very large scale and quite new types of transmission equipment can be introduced while retaining the ability to estimate the performance of the whole system. The power to plan system performance, while obviously valuable with systems likely to contain comparatively new equipment especially if quick and flexible construction is important as in defence communications, finds its main application to large static systems of slow growth such as public telephone networks.

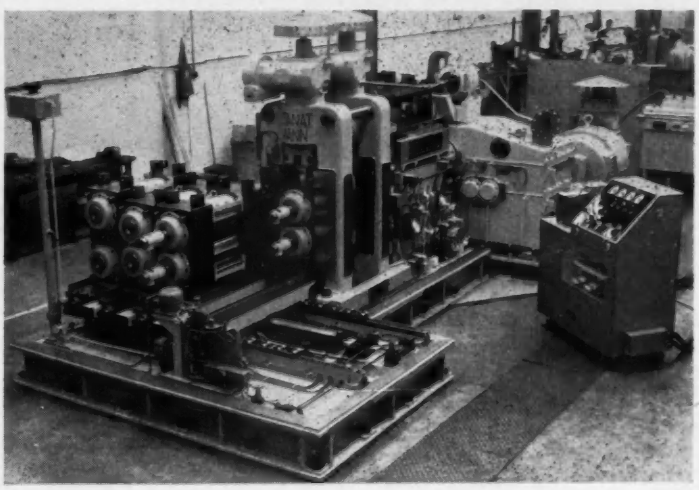
Rolling Mill for Nuclear Fuel Elements

FUEL elements for nuclear reactors take a variety of shapes and configurations including flat, curved and corrugated plates, rods, tubes and solid or hollow slugs. These contain uranium, thorium, or plutonium in metallic or compound form in addition to such non-fissionable materials as stainless steel, aluminium and magnesium. To prevent the inhalation of radioactive dust when processing these elements and give protection from their relatively low penetration ability the equipment used is enclosed in a stainless steel and " Perspex " or glass box, fitted with neoprene gloves for operating the plant within. This enclosure also permits materials which would suffer from oxidation to be processed in an inert atmosphere by introducing gas at a small negative pressure.

The Stanat/Mann combination reversible, variable-speed, rolling mill has been developed by Albert Mann's Engineering Co., Ltd., Basildon, Essex, for the Commissariat à l'Energie Atomique in France from mills already supplied to various nuclear development establishments in this country and abroad. The mill is arranged for sealing within a glove box enclosure, the drive shafts being fitted with gas-tight seals. Capable of operating at speeds of 5 to 160 ft/min the 10in diameter 14in face-width mill has a maximum rolling load of 600,000 lb and incorporates four roll configurations, two-high hot breakdown, two-high cold intermediate, four-high cold sheet finishing and form rolling, with power operated remotely controlled automatic roll assembly changing. This is carried out by an electro-hydraulic system which disconnects the roller pressure screwdown from the top roll and elevates it to a position which will accept any roll configuration. The jibs retaining the chocks in position in the mill housings are withdrawn, and the roll assembly moved on to the roll carriage which is indexed to line up the new assembly selected. The driving shaft positions are adjusted for the new roll centres to an accuracy of 0·005in, and the new assembly is drawn into the mill, the jib chocks locked into position and the screwdown mechanism lowered.

The roll pressure is adjusted by a 2 h.p. d.c. variable-speed motor driving the screwdown spindles through a double worm reduction gear, a magnetic clutch enabling individual adjustment of each side of the mill to take place at speeds varying from 0·18 mm per second for cold rolling to 2·6 mm per second for hot rolling. The motor is mounted outside the glove enclosure to avoid damage by arcing on the motor armature within an inert atmosphere. Left- or right-hand roll pressures may be read at the control desk together with the upper and lower roll neck torques, both being recorded by a two-pen high-speed recorder.

An Allen West type SR3 starter controls a Ward Leonard set comprising a Crompton Parkinson 1,450 r.p.m., 380 V, three-phase motor driving a 0/420 V, 191 A shunt-wound generator mounted on a common bedplate. This supplies a Crompton Parkinson 26/100/100 h.p., 200/750/1,500 r.p.m., force ventilated separately excited d.c. motor driving the mill rollers through a Timken double-helical reduction gear. The armature current for the pressure screwdown motor and the field excitation currents of the Ward Leonard equipment are supplied by grid regulated thyratrons with pulse controlled grids, using a circuit developed in the company's electronic laboratory. Since this control is independent of anode waveform, and does not drive the grid positive at any time, feedback control is not required, and output voltages are obtained without the motor taking current or rotating. A feature of the control system employed is the space saving possible, the associated control cabinet housing, in addition to the motor controls, the relays for solenoid control of the hydraulic circuits and the amplifying and recording systems for the roller torque and pressures.



The combination mill and its control cabinet, with the driving motors and reduction gearbox in the rear. The roll carriage and mill shown in the foreground will be mounted in a glove box forming part of an enclosed production line

Atmospheric Pollution

Author's summary of a paper on field work in atmospheric pollution carried out for the Central Electricity Generating Board, read before the Incorporated Plant Engineers at Nottingham on 8th October

By D. H. LUCAS, B.A.(Oxon), F.Inst.P., A.M.I.E.E.*

FIELD work on atmospheric pollution has been carried out so that the Central Electricity Generating Board would be able to assess whether or not one of their power stations was producing a nuisance by atmospheric pollution and, if it was, how to take efficient action to prevent further nuisance. The author points out that the expenditure of the Generating Board in preventing nuisance runs into millions of pounds each year.

The paper dealt mainly with practical work in connection with the emission of gaseous pollution (sulphur dioxide) and the emission of dust; it was not concerned with the emission of smoke (hydrocarbon which had been volatilised and condensed) since this problem had virtually disappeared from the power station field.

Ground level concentrations of sulphur dioxide had been measured for some time using the standard sulphur candle. This had been used extensively around new power stations both before and after commissioning and showed that with a power station with a high chimney the increase in sulphur dioxide pollution is hardly appreciable. However, the sulphur candle only gave indications of average results for one month and, therefore, gave no insight into the concentrations obtained from minute to minute under different conditions of weather and station operation. A new instrument had, therefore, been developed at the Central Electricity Research Laboratories.[1] This enabled the concentration of sulphur dioxide in the air to be measured in parts per hundred million and gave a measurement in about a minute.

One of the most important variables was the height at which the sulphur dioxide was emitted. It was preferable to measure this directly rather than to attempt to deduce it from the results of the sulphur dioxide recorder and a technique had been developed to measure the height to which a plume from a power station rose under various conditions.[2] The basis of the technique was to partially inflate a polythene balloon with hydrogen and to adjust its weight until it was exactly buoyant in air. It was then introduced into a power station chimney and allowed to move through the air with the flue gases. Its path was recorded by means of a range-finder on an adjustable mounting which enabled the range and the angle of elevation of the balloon to be noted simultaneously as the balloon moved away. By releasing a sufficient number of balloons the behaviour of the plume could be recorded for a range of circumstances. The technique had already given valuable information on the dependence of plume rise on wind velocity and was now being used to show the dependence of plume rise on the amount of heat leaving the chimney per second.

The technique possibly had further applications in studying the deposition of dust from plumes in which case the balloon was adjusted to have the same free falling speed as the dust being considered. Many measurements on dust deposition had already been made using the standard deposit gauge around power stations in the same way as the sulphur candle had been used. These results had shown that in addition to the variables which affected the concentration of gas an increase in the free falling speed of the dust had a very powerful influence in increasing the likelihood of dust nuisance at ground level.

Measurements in the field were important but were laborious and time consuming. It was to be hoped that, when the theoretical situation had been established, measurements at the power station would be sufficient to enable complete information on the likelihood of nuisance from power stations to be assessed.

New Design of Recording Instrument

The type of instrument already in use, which measured the optical density of flue gases as they left the power station, had very severe limitations, not the least of which was that observation windows tended to become obscured and to falsify readings. A new design of observation window had been made at the Central Electricity Research Laboratories[3] which had largely overcome this particular disability. However, there were also objections in principle to the use of this type of instrument. It tended to take more notice of fine dust particles and less notice of coarse dust particles whereas it was well known that coarse dust particles were more likely to cause trouble in the neighbourhood of power stations. A new type of recording instrument had, therefore, been developed at the Central Electricity Research Laboratories[4] which had been specifically designed to have a greater response to coarse particles than to fine. This was achieved by a special design of sampling head which collected a sample over a specified time. The final measurement was still made by light beam and photo-cell. Particular attention had been given in the design of the instrument to minimising the errors often found in photo-cell instruments due to variations in light intensity, power supply voltage and photo-cell sensitivity.

It was not sufficient to study power stations alone since they often operated in a highly complicated situation where many other sources contributed to the level of pollution. A theoretical study of sulphur dioxide emission by domestic chimneys[5] showed that they were collectively responsible for most of the sulphur pollution in cities.

* Central Electricity Research Laboratories.

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[2] Lucas, D. H., Spurr, G., and Williams, F., *Quarterly Journal, Royal Meteorological Society*, 1957, Vol. 83, p. 508.
[3] Patent Application No. 21244/58.
[4] Patent Application No. 11771/58.
[5] Lucas, D. H., *J. Air Pollution*, Pergamon Press, Vol. 1, October, 1958.

General view of the paint plant. In the middle distance can be seen the baking ovens on the mezzanine floor

CAR BODY PAINTING

New £3 Million Plant for the British Motor Corporation

A NEW painting plant has recently been completed at the Cowley, Oxford, works of the British Motor Corporation. The building, which covers about seven acres, contains two separate lines from both of which completely painted car bodies are emerging at the rate of about 52 per hour. The whole plant has been designed to economise in space and provide satisfactory working conditions. This is achieved in the layout by placing all production operations such as wiping, spraying, sanding and inspection, etc., at ground floor level with all other functions such as running attendance and maintenance either above or below the shop floor level. The four main paint-baking ovens for the filler, sealer, monotone and duotone finishes are mounted on the mezzanine floor which besides saving space, prevents the ground floor area from becoming overheated. Although the drying and baking ovens are mainly oil fired, only one being an infra-red oven, the total electrical load of the painting shop is approximately 3 MW. Two items of particular interest are the sequence control of the car body conveyors and the automatic spray equipment.

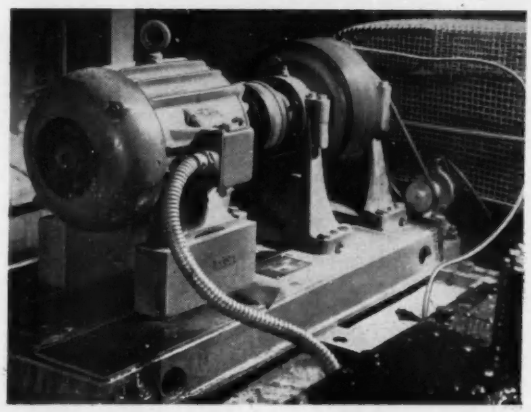
The operations in the paint shop start with a body which has been "Rotodip" primed. At present the car bodies receive this treatment in another part of the works, but a "Rotodip" installation has been installed in a bay adjacent to the two paint lines. In this machine, which will shortly be in operation, the car bodies are rotated on a spit through various baths of anti-rust and anti-corrosion primers. This "Rotodip" is the latest of its type and has been designed to use epoxy-based primer which has excellent corrosion resistance. It will be equipped with fully automatic loading and unloading gear which will also insert the spits at the loading end, remove the spits at the unloading end and return them to the load end.

The two painting lines in the plant are somewhat similar and the first process is the rubbing down of the stopper and primary with wet and dry abrasive paper. The bodies are then dried by passing through a tunnel oven and until the "Rotodip" is operating they are cooled, spirit wiped, dried in an oven and again cooled. The bodies then proceed through the first spraying booth where two coats of surfacer or filler are applied.

The spray booths are of the down-draught water-washed type, the basic function of a spray booth being to maintain a clean atmosphere in the booths whilst the bodies are being sprayed, and the first step towards achieving this end is to exhaust the paint-laden air and at the same time to make it up by fresh conditioned and filtered air. The air is washed by means of water-spray type scrubbers and the paint-laden water is led into two large underground chambers, one for the undercoating booths and the other for the colour booths.

The air replacement units for the spray booths are

Conveyor drive showing the Crompton Parkinson motor with magnetic coupling driving the belt. The small tacho-generator can be seen below the magnetic coupling



mounted upstairs. These plants use "Kompak" filters for the main filtration stage and the air enters each booth through a double thickness of "Fibreglass" cells. The colour booth plants incorporate humidifiers with dew point control to maintain a controlled relative humidity.

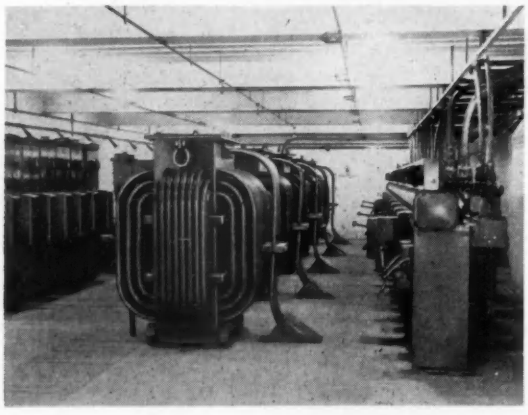
Each spray booth incorporates a Carrier-Schweitzer automatic painting machine. Each machine can cover 80 to 85 per cent of the body surface automatically. The remainder of the body, which includes the areas at the front and rear and the window mouldings, has to be sprayed by hand. The machines use specially shaped cams to control the movement of the spray guns, and cause them to follow the contour of the body. Although bodies of four different basic aspects pass through the paint shop, the cams have been designed to enable all styles to be satisfactorily painted. The top gun on each machine is automatically raised and lowered under the control of Radiovisor photo-electric cells when changing from roof to bonnet or boot lid and the breaking of a beam of light by the car body starts the painting process. It is possible to apply any one of six different colours to the spraying system and changes in colour can be made in the time interval between one body leaving and the other entering the spray booth.

Finishing Plant

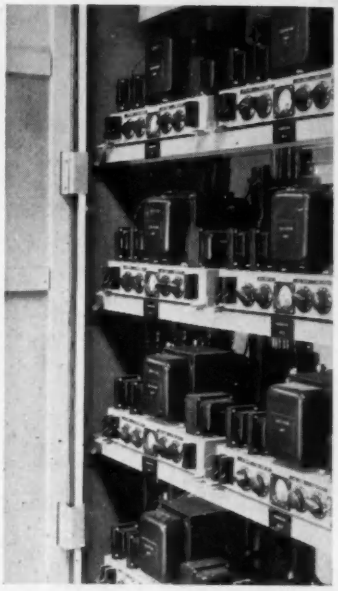
After passing through the first filler spray booth the bodies enter a small section where the solvents are flashed off before the surfacer is baked in the first oven on the mezzanine floor at 320 deg F for 45 minutes. The bodies are cooled by a cold water sprinkler system, wet rubbed, and inspected and faults are rectified before washing down and drying. These ovens are three times the length of the other dryers in the line to ensure that no moisture remains. The bodies are treated to prevent dirt adhering to the surface. The single sealer coat is then applied and baked at 280 deg F for 45 minutes on the mezzanine floor. The bodies are again inspected and imperfections rectified and again wiped down before the two wet-on-wet finishing colour coats are applied. The bodies are finally dried out at 260 deg F for 45 minutes. Although only two coats of synthetic colour finish are applied, the final dry finish is equivalent to four coats of cellulose because of the reduced amount of solvents in the synthetic paint.

The indirect oil-fired heaters are all grouped on a steel platform over the ovens. Radiovisor flame failure control is used with an air-operated air and fuel control system. A Delta air flow switch ensures that air is flowing into

Substation showing the 11 kV switchgear on the left and the 29-panel 400 V switchboard on the right



Part of the Heenan & Froude conveyor sequencing control system



an incorporated heat exchanger while a thermostat and a Delta gas flow device protect the output side of the heat exchanger.

Each production line has ten separate King conveyors on which run the bogies which can be adjusted to take any production car body. The first five conveyors on each line run at about 7ft 6in per minute and are sequence controlled. Muirhead magslip synchronising generators are employed to ensure that the body positions on any two associated conveyors are always accurately maintained, while still allowing the conveyor system speed to be varied at will. Each conveyor is driven by a 3 h.p. Crompton Parkinson motor which is coupled to the gearing via a Heenan & Froude magnetic coupling. An alnico tacho-generator is also incorporated in the drive. The motors themselves are controlled by Donovan contactors.

The sixth conveyor in each line has a double slat arrangement so that the bogies can be moved relative to each other as required for the painting processes or colour change. The control desk for the conveyors and other items on each production line is situated in a small room in the centre of the building. The mimic diagram and a system of lights indicate the position of any fault which has occurred. The control desk incorporates an ammeter for each conveyor motor so that any overloading due to friction caused by paint adhering to the conveyors can be easily seen.

Electrical Supplies

The paint plant is provided with an 11 kV supply via a works ring main system. The new substation in the basement of the building is equipped with a nine-panel Crompton Parkinson truck type 11 kV switchboard. This switchboard comprises two ring main feeder switches and seven outgoing feeder switches rated at 250 MVA with spring operation. The outgoing feeders supply seven transformers of which five, rated at 700 kVA, are situated within the substation, while two transformers of 1,000 and 500 kVA capacity respectively are placed at suitable points in the plant. The incoming ring main supplies are protected by a Translay system and the outgoing circuits have over-current protection. The output from the five 700 kVA transformers is controlled by a 29-panel Crompton Parkinson switchboard consisting of 400 V "Klad" circuit-breakers. The five transformer switches are rated at 1,200 A, four bus-section switches at 1,200 A and 20 outgoing feeder switches at 500 A. The switchboard is interlocked to prevent the possibility of two or

more transformers being inadvertently paralleled. The outgoing circuits are protected by three fused overloads.

The 0·25 sq in, three-core, 11 kV ring main cables were manufactured and installed by Crompton Parkinson. A CO_2 fire protection system with fusible links has been installed in the substation by Foamite, Ltd. The l.v. supplies are distributed at various points in the factory by six English Electric "Superform" switchboards incorporating an incoming 500 A h.r.c. fuse and isolator and the outgoing circuits are each fused and switched through Electric Construction Co. direct-on contactors. The contactor operating coils are supplied at 110 V from a small transformer incorporated in each switchboard. Each switchboard is equipped with local push-buttons and a key for local or remote control and capacitors are connected across the busbars for power factor improvement. Since all motors are direct-on starting, it is essential to ensure that they are started in sequence to prevent overloading. The automatic sequence control system has been designed by the electrical contractors, Lee Beesley. This system operates by using Siemens' Post Office relays mounted on a plug-in chassis.

List of Contractors

The main contractors are:—Painting booths and ovens, Carrier Engineering Co., Ltd.; conveyors, G. W. King, Ltd.; conveyor control system, Heenan & Froude, Ltd.; 11 kV and 400 V switchgear and cables, Crompton Parkinson, Ltd.; transformers, British Electric Transformer Co., Ltd.; building and civil engineering works, Benfield & Loxley, Ltd., and H. & F. Main, Ltd.; infra-red oven, Metropolitan-Vickers Electrical Co., Ltd. The layout and control of the entire installation was under the supervision of the Works Engineering Department of Morris Motors, Ltd.

Central control room

Electrical Equipment at the Motor Show

APART from the latest examples of automobile engineering and design among the exhibits in the ground floor display area, visitors to the 43rd International Motor Exhibition at Earls Court, London, which closes to-morrow (Saturday), also includes the opportunity of seeing a number of items of electrical interest on the first floor where accessories and components, tyres, and transport service equipment is displayed. In the service equipment section Partridge Wilson & Co., Ltd., in addition to a wide range of battery chargers and low voltage lighting accessories, show a new "Davenset" starter charger which employs a new type of circuit incorporating an electro-mechanical device working on the instant-voltage system similar to the voltage regulator in common use on motor vehicles. The company is also exhibiting, for the first time, five sizes of transformer suitable for 110 V hand tools. The secondary winding on these transformers is centre-tapped so that the maximum voltage above earth is 55 V.

Among the testing equipment in the Crypton display are several instruments designed for the workshop or garage servicing bay, including battery and starter testers, engine testers and tuners and a wide range of electrical test equipment. To meet the demand for lightweight units on small cars, Chloride Batteries, Ltd., have developed special "Exide" batteries assembled in translucent polystyrene containers so that the acid level can be seen at a glance. Apart from their established range of batteries, including "Major" power seal types in hard rubber containers and heavy-duty starter batteries, Oldham & Son, Ltd., show a selection of battery service station repair equipment while the Young Accumulator Co. exhibits "Golden Crompton" standard batteries and "Double-Duty" batteries, all with F.S.C. (factory sealed charge).

Of special interest on the stand of Philips Electrical, Ltd., is a fluorescent inspection hand lamp suitable for many applications in the domestic and commercial garage. It incorporates a 9in 6 W fluorescent switch-start type lamp, weighs 1½ lb, and is available in 200/250 and 110 V ratings.

The C.A.V. exhibits are representative of a large range of fuel injection equipment for automobile and marine diesel engines, and of electrical equipment for marine craft for battery charging, lighting and starting. Electric starters of various types and up to 7in in diameter are shown, including a new model, the "CA45 Co-axial" machine. It is an entirely new design incorporating several special features and has been introduced to perform similar duties to the "Axial" type "BS5" model.

Clean Air

PAPERS and reports presented at the recent conference at Llandudno of the National Society for Clean Air supported the text of Dr. R. Lessing's presidential address that "clean air is on the way but it has not yet arrived." A new feature of the conference was an exhibition of numerous and varied appliances designed to reduce atmospheric pollution. The most promising line of progress was illustrated on the stands of E.D.A., the G.E.C. and the Merseyside and North Wales Electricity Board and on that of British Railways in regard to users' installations. Another aspect was represented by the electrical precipitators and dust collectors, to which attention was directed by W. C. Holmes & Co., Simon-Carves, and the Sturtevant Engineering Co. These, as supplementary to the effect of chimney height, technical particulars concerning which gathered from home and foreign sources were presented by Mr. N. Bastable, indicated the unequalled contribution made by modern electric power stations towards solving the problem.

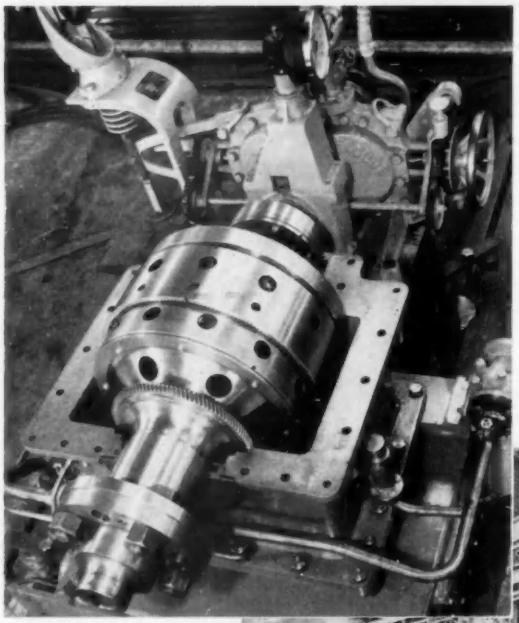
GEAR CUTTING

Re-opening of W. H. Allen's Atlas Works

DUE to a general expansion of the activities of W. H. Allen, Sons & Co., Ltd., whose products include steam and gas turbines, generators, motors, etc., it was decided that the Atlas Works at Pershore, Worcestershire, should be modernised and equipped for the complete production of the company's gears. The re-opening ceremony was performed last Friday by Admiral Sir William Tennant, Lord Lieutenant of Worcestershire.

The modernised plant is suitable for the production of Allen-Stoeckicht epicyclic gears and gearing of this type, for powers up to 13,000 h.p., is being manufactured. In addition, the works is well equipped for the manufacture of turbine gearing of the parallel-shaft type. The main advantages of epicyclic gears are the considerable savings in weight and space as compared with parallel-shaft gears, such savings being due to the fact that the transmitted load is shared between several tooth contacts. Load sharing is achieved by the provision of an annulus system which is, in itself, flexible and is connected to the gear case or shaft by means of a double gear-tooth-type flexible coupling. Also, in high-speed applications, the central sun wheel, which is supported by the planet wheels and has no bearings, is connected to the high-speed shaft by means of a double tooth-type coupling.

The main buildings contain the assembly, machine and gear cutting shops. An electric annealing furnace has also been installed for stress relieving components between machine operations. A separate shop contains a nitriding plant and facilities for white-metal lining and facing bearings and planet-wheel spindles.



Above: Epicyclic speed-increasing gear for 2,400 h.p. motor-driven boiler feed pump, assembled for testing. This gear has no main bearings; the rotating annulus is connected direct to the motor shaft and the high-speed sun wheel is supported between the three planet wheels and is coupled direct to the pump shaft. Right: General view of gear cutting shop

E.R.A. Reports

Windmills for Power Generation.—Report Ref. C/T120 "Windmills for Electricity Supply in Remote Areas" by G. Gimpel and A. H. Stodhart (price 18s) deals with the economic and technical requirements for windmills used as a source of electrical energy in areas distant from main distribution networks, and recommends a range of suitable ratings following a review of the probable applications of these machines and the known wind conditions in many parts of the world. It is suggested that a single diameter of wind rotor, in the region of 70ft, would have the widest applications and it is assumed that a price of £100-£150 per kW installed is likely to prove economic. Experience gained in recent years with windmills in the U.K. and abroad has been applied to determine the preferable features of the main windmill components. The choice of the most economic tower height and the use of fixed-pitch blades in the wind rotors are discussed in the appendices.

Electrical Properties of Tungsten Trioxide.—Report Ref. L/T351 "The Electrical Properties of Tungsten Trioxide" by J. Hirsch (price 10s 6d) is a continuation of Ref. L/T326. It describes the preparation and electrical properties of WO_3 in ceramic form, using denser specimens than in the earlier work, and it concludes that no electrical evidence of a ferroelectric state in WO_3, between −180 deg C and +100 deg C exists. The permittivity at −180 deg C lies between 25 and 30 while the true value at room temperature, after correction for the effects of interfacial polarisation, is probably not much higher. The material is much too conductive to be of practical interest as a dielectric, although the conductivity can be decreased slightly by some additives. A thermal hysteresis in permittivity and conductance was observed, but no electrical hysteresis could be detected.

Copies of the above publications are available at the prices indicated in parenthesis from the E.R.A. at Thorncroft Manor, Dorking Road, Leatherhead, Surrey.

DEVELOPMENT IN THE SUPPLY INDUSTRY

I.E.E. Supply Section Chairman's Address

THE chairman's address to the Supply Section of the Institution of Electrical Engineers was given by Mr. D. P. Sayers last Wednesday. He briefly reviewed the history of the Section and pointed out that although the heavy current side of the industry had not the same lure for the younger generation as the lighter side, there was still plenty of scope to satisfy the best brains. Mr. Sayers then reviewed the generation, transmission and distribution fields of the supply industry and discussed the potentialities of further development.

In the field of generation, the increase in size and working conditions of generating plant had been made possible by improvements in materials and techniques to which the station designer, the metallurgist and the manufacturers had all contributed. The adoption of the unit principle with consequent simplification of layout and size of buildings, had effected substantial capital economies. The use of reheat in the thermal cycle, allied to higher temperatures and pressures, had been largely responsible for the improvement in thermal efficiency. Hydrogen cooling of alternators had reduced losses and made larger machines possible. A further development, which had been pioneered in this country, was the use of water in place of gas as the cooling medium. The use of forced cooling of hollow conductors clearly offered prospects of economy wherever large currents had to be handled, as, for instance, in the external connections of very large alternators and in heavy transmission connections. However, only six or seven cwt out of every ton of coal delivered to the station appeared as useful energy at the busbars. This fact provided a major challenge to the young engineers in this all-important field. There were many important nuclear energy problems to be solved.

Associated with the growth in size and working conditions of turbines, we had seen a continuous progression towards higher voltages for transmission lines. In this country, the 275 kV supergrid was now coming into effective use. In the United States, it was assumed that 500 kV would be required in 10 years' time. The insulation for such higher voltages remained a formidable problem and the practicability of stepping up the supergrid to 400 kV depended on its solution. The main problem associated with transmission by underground cables was the cable cost. A partial answer might be the use of high-voltage direct current. For transformers the main problem was the restriction on the size of units by transport limitations. New materials and manufacturing techniques could circumvent these limitations. With switchgear, the main problem was, again, cost. In 1957, switchgear had accounted for 30 per cent of the total cost of grid schemes.

In the distribution field, the scope for greater economy and efficiency lay more within the realm of scientific management than in technology development. Nevertheless, this field perhaps afforded more scope for the art of engineering than any other. The engineer was dealing with so many unknown and uncontrollable factors: his problem was not so much to design for a specified load or performance, but to judge which performance should be selected as the basis for his designs.

New Zealand News

SINCE the 1957 report of the combined committee on power supply was written considerable progress has been made with investigations of New Zealand hydro-electric sources, and as a result a much more encouraging picture is available. A White Paper on power development tabled in Parliament recently says that the power potential of the Rangitaiki and Upper Waikato Rivers is together equal to the power to be obtained from the Waikato River below Taupo.

The following comments are made on the various potential developments:—

Upper Waikato: Investigations during the past two years have established the existence of power sources amounting to 400 to 450 MW. More detailed surveys are being carried out.

Kaituna: At normal load factor a station here would develop 84 MW, of which about 22 MW would be due to water diverted from lakes Tarawera and Okataina. The cost of this power would be higher than from schemes now under construction.

Rangitaiki: The potential of the catchment can now be definitely placed at between 280 and 300 MW. Two of the projects have been proved capable of economic development.

Whakatane: An 80 MW development is possible.

Waioeka: A cost analysis will be made as soon as the available flow is reliably estimated. It is expected that a development of about 70 MW will be practicable.

Motu: Surveys are in progress at what looks to be a very favourable dam site about four miles above the river mouth. A preliminary appraisal gave a possible development in two stages totalling 135 MW.

Mohaka: The ground control for an aerial survey of Fifty-Miles Beach below the Napier-Taupo highway bridge was completed and contour maps have been prepared for about 25 per cent of the area. There is a possibility of developing 500 MW.

A plan to harness hydro potential in the Tongariro district contemplates the diversion of additional water into Lake Taupo. The White Paper suggests that the plan could form part of power development after 1965. The potential approaches 2,000 million kWh a year and the cost, on a preliminary basis, has been assessed at about £47 million. On these figures the equivalent capacity would be 400 to 450 MW. The cost per kW would be about £110. The proposal is to divert the headwaters of the Wanganui River on the mountain slopes about 1,100ft above Lake Taupo and then, by a combination of tunnels and open channels, to convey the water into Lake Rotoaira. The diversion of the Rangitikei River would likewise be accomplished by damming one of its tributaries, the Moawhango, forming a reservoir at a height of nearly 3,000ft. The water would then be diverted by tunnels and existing stream beds into the Waipakihi River, at the head of the Tongariro River, below which two power stations with a combined capacity of 120 MW are planned. Below Lake Rotoaira, into which all the diverted water would flow, a power station of nearly 200 MW is proposed at Tokaanu.

GENERATION and DEVELOPMENT

1,500 MW Power Station Planned

The Central Electricity Generating Board has applied to the Minister of Power and the local planning authority for consent to establish a third power station at Drakelow, near Burton-on-Trent. To be known as Drakelow "C," it will have an installed capacity of about 1,500 MW, making it the largest power station yet planned in this country. The sizes of sets and boilers to be installed have yet to be decided.

The Drakelow site is on the fringe of the East Midlands coalfields which is a major source of low grade coals used in the generation of electricity. The 240 MW "A" station was commissioned in 1954 and the first set of the 480 MW "B" station is due to come into operation before the end of this year.

Area Boards' Sales

Electricity sales by Area Boards in England and Wales are analysed in the accompanying table. The national figures show an increase over September, 1957, of 3·1 per cent, but, when corrected for weather conditions and working days, the increase is 5·1 per cent.

ELECTRICITY SENT OUT BY AREA BOARDS FOR THEIR CONSUMERS

Area Board	Totals for September (million kWh)			Twelve Months' Totals Ended 30th September (million kWh)		
	1957	1958	Inc. or Dec. %	1957	1958	Inc. or Dec. %
London	505·8	500·1	−1·1	6,995·5	7,564·1	+ 8·1
South Eastern	344·0	358·9	+4·3	4,505·5	5,071·4	+12·6
Southern	440·3	473·6	+7·6	5,614·3	6,399·3	+14·0
South Western	220·7	232·5	+5·3	2,812·0	3,108·8	+10·6
Eastern	571·6	584·3	+2·2	7,285·7	8,069·9	+10·8
East Midlands*	506·4	517·7	+2·2	6,221·6	6,724·9	+ 8·1
Midlands*	645·4	668·9	+3·6	7,928·3	8,719·0	+10·0
South Wales*	396·7	415·0	+4·6	4,726·0	5,006·0	+ 5·9
Merseyside and N. Wales*	396·5	407·2	+2·7	4,892·0	5,272·5	+ 7·8
Yorkshire* (2)	646·7	645·6	−0·2†	8,116·4	8,606·3	+ 6·0
North Eastern*	379·2	384·5	+1·4	4,694·9	5,047·1	+ 7·5
North Western*	663·9	667·2	+0·5	8,378·9	8,919·5	+ 6·5
Total all Area Boards	5,717·2	5,855·5	+2·4	72,171·1	78,508·8	+ 8·8
Direct Supplies by C.E.G.B.	194·0	238·5	+22·9	2,324·7	2,866·0	+23·3
Grand Total	5,911·2	6,094·0	+3·1	74,495·8	81,374·8	+ 9·2
Mainly Industrial Areas*	3,634·8	3,706·1	+2·0	44,958·1	48,295·3	+ 7·4
Mainly Non-Industrial Areas	2,082·4	2,149·4	+3·2	27,213·0	30,213·5	+11·0

* Those in which industrial consumers took over 50% of the total sales in the preceding financial year.
† The Yorkshire Board is at present temporarily taking a supply from an outside source. If this is allowed for the change would be +2·7%.

Complaint of Frequent Supply Failures

Bishop Auckland U.D.C. is to protest to the Ministry of Power against the inconvenience caused by alleged frequent breakdowns in the electricity supply in the northern part of the town. At a meeting of the Council, the chairman (Ald. Middlewood) said the failures in the service had gone on for four years and were causing great inconvenience, especially to business firms.

Meters Outside Houses

Mr. R. F. Richardson, chief commercial officer of the South Western Electricity Board, told the Area Electricity Consultative Council on 17th October that the Board's engineers were studying proposals to install meters in boxes outside houses so that they could be read without meter readers having to enter the premises. The use of these boxes would add between £1 and £2 to the cost of a service, but the time which would be saved might make it a worthwhile investment. Mr. Richardson told the Press later that the Board would start experimenting at Bristol this year and was looking for a suitable estate in the city.

Public Utilities and Road Works

A proposal that special conferences of county highway authorities and gas and electricity undertakings should be arranged each year to map out a co-ordinated programme of major road and public utility works is suggested by the Highways Committee of the County Councils Association. This is contained in a memorandum of evidence prepared for submission to the Ministry of Power committee on co-operation between Area Gas and Electricity Boards.

The memorandum points out that county highway authorities usually notify public utility undertakings of their programmes of road resurfacing and other maintenance works. The Gas and Electricity Boards do what they can to fit in work with these programmes but the Association believes that a further measure of co-operation between the public authorities is possible and would bring fruitful results.

The C.E.G.B.'s Colliers

One of the lesser known sides of the electricity supply industry provides the interesting subject of a new film, "Collier Fleet of the C.E.G.B.," which has been produced in colour with a sound commentary by the Board's P.R. photographic unit. Some 11·6 million tons, or more than a quarter, of the coal used by the C.E.G.B. in its power stations in England and Wales is transported by sea and of this quantity nearly 6·3 million tons is carried in the Board's own colliers.

Although owned by the Board, the ships are operated by agents, and the film reviews first the functional operation of the fleet and then goes on to describe in more detail the three principal classes of collier used. These are the "Big" ships of 4,600 tons deadweight, which serve the power stations with deep water berths; the "Up River" ships which are designed to pass under the low arches of the Thames bridges; and the "South Coast" ships. The high standard of navigational aids and communication facilities, and the attention paid to crew accommodation, are shown in a record of a typical voyage from Immingham to Barking. Of particular interest are the variety of mechanical methods used for loading the ships.

The film lasts for about 40 minutes and is available, in 16 mm size, on free loan from the Board.

Installation Inspection

A thorough inspection and test of electrical installations by a competent electrician is advised by the Fire Protection Association in a new booklet on country houses, to ensure that the insulation is in good condition, that the capacity of installations is adequate for the load and that connections to all power and lighting points and switches are properly made.

The Association says: "Insulation resistance tests are not conclusive evidence of the condition of an installation and inspection of the wiring is essential to ensure that there are, for instance, no loose connections under floorboards. An adequate number of power points, fed by switches and wiring of adequate capacity, should be installed so that there is no need for lighting points and wiring to be used to supply power appliances. Defective flexible cable and cord should be replaced in its entirety. Repairs by means of taping should be avoided. After 25 years the installation should be suspect."

Alternative Routes for Kent Line

When the inquiry was opened at Ashford last week into the Central Electricity Generating Board's proposal to erect a 275 kV line from Dungeness to Canterbury Mr. S. R. B. Cooke, for the Board, said that two alternative routes were put forward. Some local authorities and residents objected to one route and some to the other; the Board thought that the choice was nicely balanced and was content to leave it to the Minister. The easterly route crossed the Downs at Postling, Romney Marsh, and the escarpment near Hythe, while the inland route crossed the Downs at

ELECTRICITY GENERATED AND SENT OUT: NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

	Totals for September (million kWh)			12 months ended 30th Sept. (million kWh)		
	1957	1958	Inc. or dec. %	1957	1958	Inc. or dec. %
Generated—Water Power ...	126·260	115·403	− 8·6	1,624·798	1,659·693	+ 2·2
Steam	10·474	20·967	+100·2	234·381	274·653	+17·2
Diesel	4·264	4·247	− 0·4	59·055	65·322	+10·6
Total generated...	140·998	140·617	− 0·3	1,918·234	1,999·668	+ 4·2
Sold to South of Scotland ...	26·104	26·130	+ 0·9	431·147	372·848	−12·9
Sent out to Areas	108·463	104·930	− 3·3	1,374·877	1,508·390	+ 9·7

Stowting and Brabourne and the escarpment at Aldington and Bonnington. The Kent County Council, the Royal Fine Art Commission and the National Parks Commission preferred the inland route, but the County Council and others suggested that the line or part of it should be underground. This was impossible, because it would cost £310,000 a mile against £23,000 a mile for an overhead line.

North of Scotland Output

In giving details of the electricity generated and sent out by the North of Scotland Hydro-Electric Board in last week's issue (p. 797) we regret that the columns for 1957 and 1958 were inadvertently transposed. The correct figures are shown in the above table.

New Tariffs in Jersey

The Jersey Electricity Co., Ltd., has announced simplified and standardised domestic and business two-part tariffs. While the new tariffs show an overall reduction in the price of electricity, the company states that there may be individual exceptions. The new tariffs will benefit particularly those who increase their use of electricity.

Domestic consumers with from three to 13 rooms will be assessed at between 40 and 90 kWh and those with over 13 rooms at 100 kWh (subject to a deduction if a water heating relay is installed). For the primary block the charge will be 6d/kWh; for the secondary block (five times the primary kWh) 1·7d/kWh; and all consumption in excess at 1·4d/kWh.

For business consumers the tariff will be based on an assessed lighting load up to 5 kW or a lighting demand of over 5 kW, plus an assessment for motors, process heaters, battery chargers, etc., but not for cooking, water heating or space heating. The maximum permitted load under the tariff will be 30 kW for all purposes. The primary block will be made up of 20 kWh per 125 W of lighting load and 10 kWh per 500 W or 0·5 h.p. for any other assessed load per quarter, and will be chargeable at 6d/kWh. The secondary block will be charged at 1·7d/kWh and additional consumption at 1·4d/kWh.

The new tariffs will come into force on 1st January, 1959. At the same time the company will withdraw its special water heating tariff and the 5 per cent prompt payment discount.

South of Scotland Reinforcement Schemes

A number of reinforcement schemes to meet the increasing loads have recently been approved by the South of Scotland Electricity Board. One, covering the west central area of Edinburgh and estimated to cost £273,400, includes the construction of three substations at Dean Bridge, William Street and Rose Street Lane to be fed by two new 33 kV circuits from Telford Road grid substation. Work on the scheme is expected to be completed by the end of next year.

In East Greenock and Port Glasgow reinforcement will be effected by the provision of two feeders from Dellingburn 132/11 kV substation, one to Kingston substation, East Greenock, and the other to Bruce Street substation, Port Glasgow. In addition, modifications will be carried out to the existing switchgear in these substations. The work, estimated to cost £23,000, will be completed during 1959.

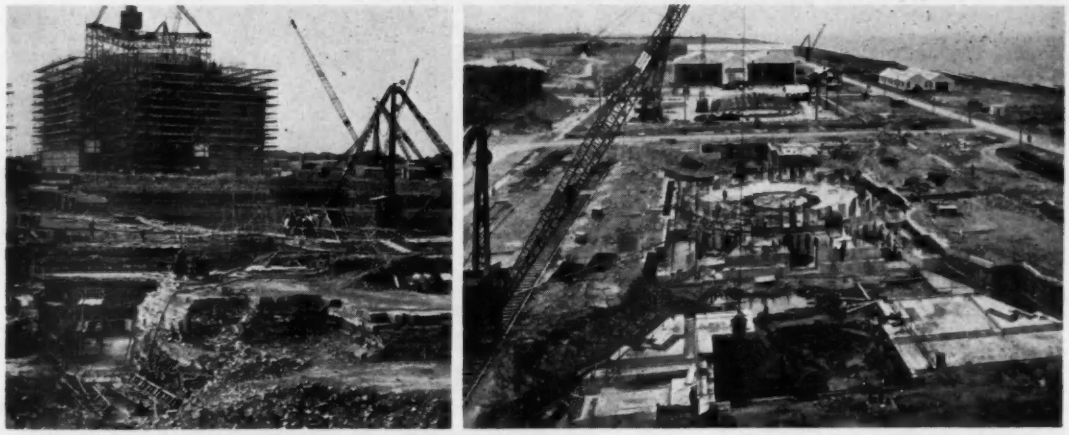
A new 33 kV overhead line, to replace an existing 11 kV line, is to be constructed between Kilmarnock and Monkton at an estimated cost of £82,600. Also included in the scheme is the provision of new switch equipment in Kilmarnock generating station and Monkton substation. The work will be completed by 1960.

In the Newhouse 33/11 kV substation two existing 10 MVA transformers are to be replaced by two 20 MVA units and a new eight-panel switchboard will be installed.

Road-Heating Experiments

As a result of discussions between Mr. W. Gilchrist, chief commercial officer of the Merseyside and North Wales Electricity Board, and the Liverpool city engineer and surveyor, Mr. H. T. Hough, plans have been made and approved for the experimental use of electricity for heating various types of road surfaces.

It is anticipated that the method to be adopted will be to lay a grid of heating cables on the top of the existing paved setts, covering it with 1½in to 2in of cold tarmac. The design of the heating grid and the voltage at which it will be used are under consideration, and it is hoped to have the experimental sections in operation before the most severe winter weather is encountered. There will be automatic control of the temperature.



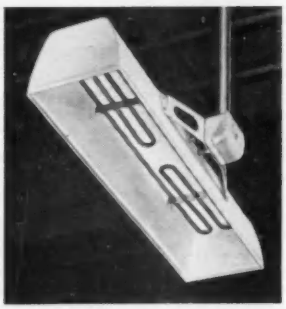
No. 1 reactor at Hinkley Point site is now over 100ft high and overlooks excavations into the limestone and shale rock-bed for the turbine hall and cooling water culverts. Right: View from No. 1 reactor looking west. The shape of the foundations for No. 2 reactor can be clearly seen

NEW ELECTRICAL EQUIPMENT

Radiant Space Heater

A weatherproof radiant space heater with a loading of 1½ kW has been introduced by the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester, 17. Similar in general design to the company's 3 kW model, it consists of an anodised aluminium reflector, tubular metal-sheathed heating element, stainless steel element supports, and a die-cast aluminium alloy weatherproof terminal box. The element ends are sealed into the terminal box with silicone rubber bushes.

The unit, which weighs 5 lb, can be mounted from the terminal box by a single 1in dia. conduit. A fixing bracket permitting angular adjustment in one plane is available as an extra.



Metrovick 1½ kW radiant space heater

The element has a robust tubular outer sheathing of non-corrodible alloy and can withstand rough handling. For commercial installations both the 1½ kW and 3 kW models can be supplied with an ornamental bezel enabling the unit to be built in to the ceiling or suspended from conduit or chains.

Smoke Density Indicator

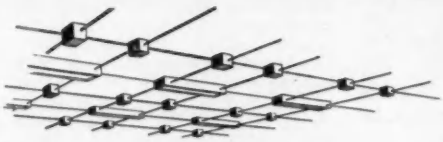
A portable smoke density telescope, designed at the fuel research station of the Department of Scientific and Industrial Research, providing a simple means of assessing the density of smoke plumes issuing from chimneys was shown at an exhibition in Llandudno, held in conjunction with the annual conference of the National Society for Clean Air. Smoke is viewed through the telescope and its density compared with two incorporated translucent screens corresponding to No. 2 and No. 3 Ringelmann shades. The smoke and screens are seen against the same background to enable an accurate estimation of the smoke density to be made. To comply with the Clean Air Act smoke as dark or darker than Ringelmann No. 2 shade may be emitted for very limited periods only. The telescope is obtainable from W. OTTWAY & CO., LTD., Northfield Avenue, London, W.13; it costs £9.

Transistor Printer

The Essex power driven model E1A-TPR printer made by REJAFIX, LTD., 81-83, Fulham High Street, London, S.W.6, has been designed expressly for printing on transistors, which are handled into the machine at a rate of up to 1,500 per hour and automatically printed and checked.

Ceiling Lighting System

A new suspended ceiling lighting system, the "Tracelite," suitable for large or small installations, is offered by COURTNEY, POPE (ELECTRICAL), LTD., Amhurst Park Works, Tottenham, London, N.15. Basically it consists of a number of rectangular fittings, designed to accommodate one, two or three 4ft or 5ft fluorescent lamps, and a number of steel boxes, measuring 12in square by 6½in, which may contain tungsten fittings, loudspeakers, portable signal mechanisms, etc. The undersides of the boxes can be finished in any colour.



Courtney, Pope "Tracelite" lighting system

The actual suspension is by conduit from the structural ceiling, two suspensions per fitting and one suspension per box. The linking rods are of ¾in aluminium, finished in anodised silver or gold. These linking rods may be used for the wiring. The diffusers may be of steel, plastic, "Perspex," glass, etc., and for the void it is suggested that this be finished in a dark colour. Alternatively, infill panels may be suspended from the linking rods to form a modular type ceiling. The complete module is planned on the merits of any particular installation and linking rods are supplied to order.

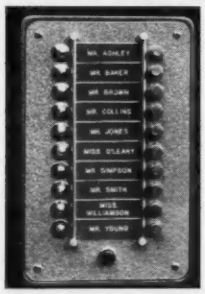
Impregnated Bearings

Porous sintered bronze bearings impregnated with polytetrafluoroethylene (P.T.F.E.) for lubrication and used in applications where oils or greases may be objectionable or unable to withstand the conditions of operation, have been announced by BOUND BROOK BEARINGS, LTD., Trent Valley Trading Estate, Lichfield, Staffs. P.T.F.E. is a white, inert plastic with a high melting point and a low coefficient of friction and "Polyslip" bearings consist of an impregnated porous bronze matrix, the matrix acting as the load carrier and heat dissipator and the P.T.F.E. as the lubricant.

Bearings are available in two grades, fully or partly impregnated with P.T.F.E., the latter intended for light duties. They are intended for use where conventional lubricants are undesirable.

Executive Indicator

An executive indicator system developed by HADLEY TELEPHONE & SOUND SYSTEMS, LTD., Smethwick, Staffs., provides a signal by illuminating a miniature neon lamp. The button on the "entrance" panel is pressed by the executive on arrival or departure, the interlinked slave units in the individual offices and a separate unit at the telephone switchboard giving the appropriate indication. The panel for the switchboard operator offers an additional facility enabling any light to be flashed intermittently as a "wanted" signal.



Hadley executive indicator "entrance" panel

The cost of the equipment for a typical installation comprising ten slave indicators, an "entrance" unit and a switchboard or staff location unit is about £100. Slave units measure 5in by 9in and the special units 6½in by 10in; both can be either flush fitting or surface mounted. The mechanism of each unit is housed in a grey steel case with an apple green hammer-finish front panel, and nameplates bear white lettering on a green background. In its standard form the indicator is designed for up to ten executives, although larger systems can be provided.

Radiators and Convectors

A recent announcement from the MIDLAND ELECTRIC MANUFACTURING CO., LTD., Reddings Lane, Tyseley, Birmingham, 11, states that a 2 kW version of the "Memrad" electric radiator is now available and the range of "Memvek" convector heaters now includes a 3 kW model.

M.E.M. 3 kW "Memvek" convector (left) and 2 kW "Memrad" radiator

The new "Memrad" radiator is provided with an internal thermostat and is suitable for the kitchen, hall or bathroom. It measures 26½in high by 41½in long by 7in deep and is finished in mushroom enamel with red handle and feet or, alternatively, bronze with brown handle and feet. The price is £12 12s 5d.

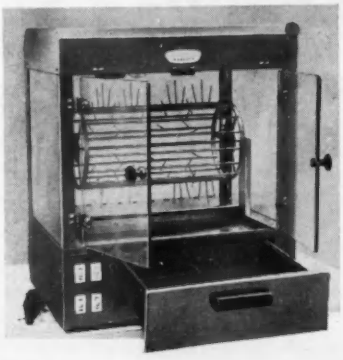
The 3 kW "Memvek" convector is available in switched or thermostatic patterns and in a choice of finishes which include bronze, cream, mushroom, primrose, or eau-de-nil. It measures 32½in wide by 21in high (plus 3in for feet on portable models). The portable types are priced at £12 12s 5d (switched) and £13 10s 8d (thermostatic) while models suitable for wall mounting are slightly cheaper at £11 15s 4d (switched) and £12 13s 8d (thermostatic). All the foregoing prices include purchase tax in the United Kingdom.

Rotary Griller

A new rotary griller, capable of grilling up to 96 frankfurters in two banks of 48, has been announced by TRICITY COOKERS, LTD., 109, Kingsway, London, W.C.2. The machine is designed in chromium-plated steel, with heat resistant glass panels and doors, and all interior parts coming into contact with food are of stainless steel.

Independent switching is provided for the left- and right-hand elements, which enables 48 frankfurters to be kept warm while the other 48 are grilling. The glass door is in two sections to facilitate batch cooking and a drawer is provided in which soft rolls can be kept warm and moist. An interior light is fitted.

Tricity Cookers rotary frankfurter griller



The total weight of the griller is 58 lb and it measures 23½in high by 20in wide by 15in deep. Two sheathed type rod elements (250 W each) and a standby 270 W element heater are provided and the drawer is heated by a thermostatically controlled 125 W heater. The spit, which rotates at 4 r.p.m., is driven by a synchronous self-starting motor.

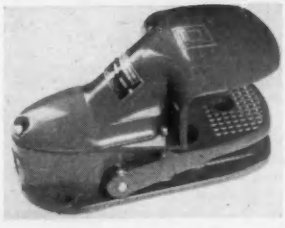
Foot Switches

A range of industrial heavy duty dust- and oil-tight foot switches designed for use in industrial applications where machines or process cycles require starting at a time when neither of the operator's hands is free, has been introduced by SQUARE D, LTD., 100, Aldersgate Street, London, E.C.1.

Twelve models are available giving circuit arrangements up to two normally open and two normally closed poles. Double throw construction is incorporated and the trip point is adjustable with respect to the foot pedal position. Models arranged for two-stage operation can be supplied, with a distinct pedal pressure difference existing between the first and second stages. Mechanical latching controlled by a small auxiliary side pedal can be provided to maintain contact in either stage of the two-stage models in addition to latching on single-stage types, or a ratchet mechanism to hold the contacts maintained until the pedal is again depressed can be included.

The cast aluminium enclosures are gasketed for oil and dust exclusion, and a 1in dia. conduit entrance is provided in the rear of the switch. Three fixing holes are embodied for permanent floor or machine mounting, although the weight of the foot switch is sufficient to prevent sliding or tilting even when unmounted. The operating pedal is deeply grooved to minimise slipping.

Square D foot switch



Spin Dryer

Up to 6 lb of clothes (dry weight) at a time can be rinsed as well as spun in the "Spinarinse" spin dryer, the latest domestic laundry aid to be marketed by HOOVER, LTD., Perivale, Greenford, Middlesex. It is fitted with an automatic pump for emptying purposes and the washing suds can be automatically returned for re-use and rinsing water pump-emptied to the sink after the rinsing is completed. Emptying is through a rigid plastic pipe which can be swivelled to retain the suds for further use or adjusted to sink height to run off the rinse water.

The water extraction efficiency rate of the machine is said to be high and after spinning, cottons and lighter fabrics are dry enough to iron. The spinner has a minimum speed of 2,300 r.p.m. and consists of a perforated basket mounted to rotate within an outer can. Both the basket and the outer can are of aluminium. The water is spun out of the clothes by centrifugal force into the outer can and thence to the extraction pump, finally emerging from the outlet pipe. A flexible rubber diaphragm at the base of the outer casing centralises the spin basket and takes up excessive vibration should the clothes be out of balance. The machine is powered by a 350 W motor and can be supplied in all normal a.c. voltage ranges. It is controlled by the opening and shutting of the lid and an automatic brake stops the spinner when the lid is opened. It measures 30½in high by 13¼in wide by 15¼in deep and the weight is 48 lb. Rubber wheels are provided and the finish is white stoved enamel, with blue base, and the lid, of anodised aluminium, is sapphire blue.

The price of the "Spinarinse" is £36 15s, including purchase tax.

Hoover "Spinarinse" spin dryer

Financial Section

STOCKS and SHARES

SINCE prices in the industrial markets of the Stock Exchange had risen by an average of more than 30 per cent over the past eight or nine months, there was nothing very surprising in the recent appearance of some irregularity in their behaviour. After an ascent of this pace and extent, an occasional bout of profit-taking is bound to occur, and the question of whether or not the anticipations of investors are running too far ahead of events comes up for review. At the beginning of this week the trend was mildly reactionary. For the first time in some weeks the accompanying share tables consequently show rather more minus than plus signs among the changes, but in few cases do they amount to anything significant.

Irregular Market

Evidence of a moderate reaction in industrial share prices is to be seen in the losses of a shilling to half-a-crown in some of the leading electrical equipment issues, including A.E.I. at 53s 9d, English Electric at 57s 6d and G.E.C. at 36s 9d. Other shares which shed a part of previous large gains included Plessey at 70s, Ward & Goldstone at 33s, British Aluminium at 52s, Decca "A" at 28s 9d, London Electric Wire at 61s 3d and Elliott-Automation at 18s 3d. Thornycroft were a particularly dull spot at 25s, having dropped 5s 9d after news of the fall in profits and the reduction of the dividend from 12½ to 7½ per cent. Good features, however, were by no means lacking. New "highs" for the current year were established by B.I.C.C. at 49s, Berry's Electric at 8s 6d, Heatrae at 7s 3d, S. Smith at 10s 6d, Vactric at 29s, Simon-Carves at 29s 3d and Philips Lamps at 72s 6d. Reyrolle consolidated the big advance of the previous week and Crompton Parkinson were firm in advance of the final dividend declaration.

Watford Electric

The 2s shares of the Watford Electric Company have been in good demand since the distribution of a one-for-four scrip issue in the middle of the year, and the subsequent maintenance of the interim dividend at 5 per cent, the same rate as before, on the larger capital of £219,000. For many years the company has been producing increasingly good financial results; the latest of them, in respect of 1957, showed a particularly sharp improvement to £70,000 in the net profit (after tax) which covered about 2½ times over the amount of the 25 per cent distribution. In the report, the state of the order book was said to give cause for optimism, despite keener competition. The final dividend for 1958 is due to be declared next March. If the rate for this year were to be reduced strictly in proportion to the capital increase, the yield on the shares at 7s 3d would be 5½ per cent.

J. Lucas Dividend

The Motor Show comes as a reminder that the financial year of Joseph Lucas

Price Changes in

Company or Board	Nom. Value	Middle price 27th Oct.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1958 Highest	1958 Lowest
Gilt-edged Stocks								
Brit. Elec. 1968/73	100	76½		3	3	3 18 6	76½	72
Brit. Elec. 1974/77	100	73½		3	3	4 1 9	73½	68½
Brit. Elec. 1976/79	100	77	−½	3½	3½	4 11 0	78½	72
Brit. Elec. 1974/79	100	87		4½	4½	4 17 9	87½	82½
Overseas Electric Supply								
Calcutta Elec.	£1	16/6		6·8†	7†	8 9 9†	17/6	15/-
East African Power	£1	23/-		7½	8	6 19 3	23/-	17/6
Nigerian Elec.	£1	14/6		10	10	13 16 0	17/-	12/6
Perak Hydro-Elec.	£1	14/-		12½	10	14 5 9	15/6	13/6
Electrical Shares								
Aberdare Holdings	5/-	13/6		17½	17½	6 9 9	13/9	9/9
Aerialite	1/-	7/3	−6d	48	51½	7 2 0	8/-	5/1
Allen, W. H.	£1	43/9		10	11	5 0 6	43/9	32/9
Anglo-Portuguese Tel.	£1	28/3		8	9	6 7 6	29/3	19/9
Aron Elec. Ord.	£1	60/-		15	15	5 0 0	60/-	53/-
Assoc. Elec. Ord.	£1	53/9	−1/3	15	15	5 11 6	55/-	46/6
Automatic Tel. & El.	£1	70/-		17	17	4 17 3	70/-	57/-
Babcock & Wilcox	£1	52/6		15	13‡	4 19 0	54/6	41/9
Bakelite	10/-	23/-		15	15	6 10 6	23/-	17/6
Baldwin, H. J.	2/-	2/9		20	20	—	3/9	2/6
Berry's Electric	5/-	8/6	+6d	10	10	5 17 9	8/6	5/9
British Aluminium	£1	52/-	−2/-	12	12	4 12 3	55/-	37/-
Brit. Elec. Traction: Def. Ord. "A"	5/-	34/-	−6d	25	25	3 13 6	34/6	19/6
B.I. Callender's	£1	49/-	+1/-	12½	12½	5 2 0	49/-	38/9
B.I. Callender's 6% Pref. ...	£1	20/-		6	6	6 0 0	20/3	19/-
British Tabulating	£1	55/6	−2/-	9	10	3 12 0	57/6	38/6
British Thermostat	5/-	34/9	−6d	25	30	4 6 3	35/3	19/9
British Vac. Cleaner	5/-	4/3		10	10	5 17 9*	4/3	2/3
Brook Motors	10/-	49/6		25	25	—	50/-	33/3
Bulgin, A. F.	1/-	7/-		40	45	6 8 6	7/-	4/7
Bulpitts	5/-	9/3		—	12½‡	6 15 3	9/3	7/3
Burco Dean	5/-	9/9		20	22½	7 13 9*	10/-	7/9
Cable & Wireless: Ord.	5/-	12/6		10	10‡*	4 0 0	12/6	8/-
4% Loan	100	94		4	4	4 4 0	94½	89
Chloride El. Storage "A" ...	£1	64/3	−1/6	17½	17½	5 9 0	66/3	55/6
Clarke Chapman	£1	64/3		27½	27½	4 5 6*	72/6	55/-
Cole, E. K.	5/-	17/-	−6d	17½	17½	5 3 0	18/-	15/3
Cossor, A. C.	5/-	5/3		2½	Nil	Nil	6/-	4/4
Crabtree	10/-	31/6		20	20	6 7 0	31/6	24/4
Crompton Parkinson	5/-	13/-		16	16	4 2 0*	13/6	8/3
De La Rue	10/-	29/6	+6d	35	17½*	5 18 9	29/6	20/9
Decca "A"	4/-	28/9	−2/-	43½	43½	6 1 9	30/9	21/3
Desoutter	5/-	16/6		32½	18½*	5 13 9	16/6	13/6
Dewhurst	2/-	9/-		16½	20	4 9 0	9/-	6/9
Dictograph Tel.	2/-	7/3		20	20*	5 10 3	7/3	4/7
Dubilier Condenser	1/-	3/6		30	20*	5 14 3	4/3	3/1
Duport	5/-	10/9		25	25	5 16 3*	10/9	7/9
E.M.I.	10/-	47/6		15	15	—	48/-	27/6
Electrical Components	5/-	9/-	−3d	12½	12½	6 19 0	9/9	7/-
Elec. Construction	£1	27/6		8½	8½	6 3 9	27/6	21/-
Elliott-Automation	5/-	18/3	−1/-	—	10‡	2 14 9	19/9	11/6
Enfield Cable Ord.	£1	17/-	−1/-	Nil	2½	2 18 9	18/9	10/9
English Electric	£1	57/6	−2/6	14	14	4 17 3	60/-	44/-
English Electric 3½% Pref. ...	£1	12/6		3½	3½	6 0 0	12/6	11/9
Ericsson Tel.	5/-	25/3		22†	12*†	2 7 6†	25/3	17/6
Ever Ready	5/-	20/9	−6d	37½	20*	4 16 6	21/3	13/9
Falk Stadelmann	£1	45/6		17½	17½	7 13 9	46/3	35/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

(Industries) finished in July, and that if the last precedent is followed the final dividend and the preliminary profits statement will be announced in the early part of next month. Starting this year at 28s, the £1 shares have climbed steadily to over 40s, and are now showing a yield of less than 3¾ per cent on the basis of the 7½ per cent dividend paid for 1956–7. No doubt the fine production returns from the motor-car industry have been a major factor in raising the anticipation of good figures in the coming results, although in last year's report the chairman put emphasis upon the width of the field covered nowadays by the group's activities. There has been no change in the ordinary dividend rate since it was raised as a sequel to the 100 per cent scrip issue in 1954. Last year's payment was covered four times over by available earnings, and was supplemented by a special tax-free distribution of 1¼ per cent.

Electrical Investments

Company or Board	Nom. Value	Middle price 27th Oct.	Week's Rise or Fall	Dividend Pre-vious	Dividend Last	Yield % £ s d	1958 High-est	1958 Low-est
Electrical Shares—continued								
G.E.C. Ord.	£1	36/9	−3/3	12½	10	5 8 9	40/-	29/3
G.E.C. 6½% Pref.	£1	21/6	+3d	6½	6½	6 1 0	21/6	20/3
General Cables	5/-	9/9		30	24	—	11/9	8/3
Greenwood & Batley	£1	52/6		17½	20	7 12 6	52/6	45/-
Hackbridge Holdings	5/-	14/3		20	20	7 0 3	14/9	7/6
Hackbridge & Hewittic	5/-	14/6		20	20	6 18 0	14/6	9/7
Head Wrightson	5/-	23/9		22½	17½*	3 13 9	23/9	16/9
Heatrae	2/-	7/3	+3d	15	20	5 10 3	7/3	4/-
Henley's	10/-	19/-	−3d	11½	11½	6 1 0	19/3	10/6
Holophane	5/-	14/6		37½	22½*	7 15 3	15/3	12/6
Hoover	5/-	49/-	−6d	50	50	5 2 0	49/6	31/-
I.C.I.	£1	34/6	+6d	10	12	4 12 9*	35/-	23/9
Intl. Combustion	5/-	27/6		22½	25	4 11 0	27/6	19/3
Johnson & Phillips	£1	21/9	−9d	10	5	4 12 0	25/-	15/-
Lancashire Dynamo	£1	40/-		11	11	5 10 0	40/-	28/6
Laurence Scott	5/-	16/9		15	15	4 9 6	16/9	12/6
Lister, R. A.	£1	31/-		10	10	6 9 0	31/-	23/-
London Elec. Wire	£1	61/3	−1/3	12½	12½	4 1 9	63/-	39/6
Lucas, J.	£1	41/-	+1/6	7½	7½	3 13 3	40/-	27/9
Marconi Marine	£1	36/3		10	10	5 10 3	36/3	29/-
Marryat & Scott	2/-	7/6		35	37½	5 0 0*	7/7	5/3
Mather & Platt	£1	47/6	+1/3	15	15	4 4 3*	47/6	29/6
Metal Industries	£1	42/-	−3d	9	14	6 13 3	42/9	22/9
Midland Elec. Mfg.	£1	58/9		12½	12½	4 5 0	58/9	44/-
Morphy-Richards	4/-	18/9		20	20	4 5 3	19/-	14/6
Murex	£1	55/-	−1/3	20	17½	6 7 3	59/3	48/-
Newman Ind.	2/-	2/9	+6d	10	10	7 5 6	2/9	2/3
Oldham & Son	1/-	3/-		17½	17½	5 16 9	3/-	2/3
Parsons, C. A.	£1	52/6		8½	7½*	2 17 3	53/6	43/-
Plessey	10/-	70/-	−2/6	30	30	4 5 9	72/6	55/-
Pye "A" Deferred	5/-	16/-		12½	12½	3 18 3	16/-	10/-
Pyrotenax	5/-	28/9	−1/-	—	27½‡	4 15 9	30/6	27/6
Reyrolle	£1	88/9		17½	17½	3 19 0	88/9	73/6
Rheostatic	4/-	7/6	+6d	12½	12½	6 13 3	8/-	6/-
Richardsons Westgarth	10/-	15/3		16¾	8¾*	5 9 3	15/9	13/-
Scottish Cables	4/-	11/9		27½	27½	5 8 9*	11/9	7/-
Simon-Carves	5/-	29/3	+3d	20	25	4 5 6	29/3	22/6
Smith (England), S.	4/-	10/6	+3d	17½	20	3 16 3*	10/6	7/-
Southern Areas	£1	12/-		7½	Nil	Nil	13/9	9/3
Strand Elec.	5/-	8/3	+6d	15	15	9 1 9	8/3	4/9
Sturtevant	5/-	17/3	+1/6	15†	15†	4 7 0†	18/-	14/9
Sun Elec.	£1	57/6		25	25	8 13 9	60/-	47/3
Switchgear & Cowans	5/-	8/6x.c.	−3d	25	22½	6 12 3*	8/9	4/6
Taylor Tunnicliff	5/-	16/9		15	17½	5 4 6	16/9	11/9
T.C.C.	10/-	37/6	+2/6	25	25	6 13 3	38/6	32/6
T.C. & M.	£1	29/9		8½	8½‡	5 14 3	30/-	20/-
Telephone Mfg.	5/-	5/9		10	10	8 14 0	5/9	4/6
Telephone Rentals	5/-	12/3		12½	12½	5 2 0	13/6	9/9
Thompson (John)	5/-	25/6	−1/-	25	25	4 18 0	27/-	23/-
Thorn Elec. "A"	5/-	22/6		17½	17½	3 17 9	23/3	17/-
Thornycroft	£1	25/-	−5/9	12½	7½	6 0 0	30/9	21/-
Tube Investments	£1	71/3		15	17½	4 18 3	71/3	48/3
Vactric	5/-	29/-	+1/9	25	25	4 6 3	29/-	14/3
Veritys	5/-	5/3		12½	2½	2 7 6	6/9	5/3
Walsall Conduits	4/-	16/9		20	22½	5 7 6	16/9	11/-
Ward & Goldstone	5/-	33/-	−6d	40	25*	3 15 9	33/6	23/6
Watford	2/-	7/3		25	25	5 10 3*	7/3	4/-
Westinghouse	£1	41/9	−9d	18	10*	4 15 9	42/6	32/3
West, Allen	5/-	11/9x.c.		15	12½*	—	11/9	7/9
Wolf Electric	5/-	8/6	−3d	20	20*	5 17 9	9/-	6/9

New Issues

The high activity which accompanied the recent introduction of Pyrotenax 5s shares to the market has subsided, but the price has been well supported at around 29s. At this level the yield is prospectively 4¾ per cent on the basis of the 27½ per cent dividend forecast in the prospectus. Arcolectric 1s shares have been steady at 1s 9d, and Kango Electric Hammers 4s shares improved to 5s 3d. Yields on the prospectus estimates are respectively a little over 8½ and 9½ per cent at these prices. All three of these issues can be bought free of the 2 per cent transfer stamp duty.

Yields of 6½ Per Cent

Contactor Switchgear 5s shares were quoted at about 11s 3d after the announcement of a final dividend for 1957–58 making a total of 14 per cent on capital increased this year to £300,000 by the scrip issue. This represents a slight increase on the previous distribution, and puts the shares on a yield basis of 6½ per cent. From the preliminary figures the distribution appears to be covered more than three times over by the improved net profit of £84,000. Electrical Apparatus report a net profit of £174,000 after tax, and are bringing the distribution for the year ended last July to a total of 14½ per cent, which is 2½ per cent more than the equivalent payment for 1956–7, during which the capital was doubled, to £563,000, by a scrip issue. At 11s 9d the 5s shares also show a yield of about 6½ per cent.

Franco Signs Issue

New 10s ordinary shares of Franco Signs offered at par to shareholders, are being dealt in at about 17s, and are still transferable free of stamp duty. Expansion of the net profits in recent years has enabled the company to raise the dividend by stages from 10 per cent for 1953–4 to last year's 13½ per cent, and in their statement accompanying the new issue the directors envisaged the maintenance of that rate on capital increased as a result to £392,000. They base this forecast on the estimate that profits in the financial year just ended will be approximately in line with those of the previous twelve months. For that period there was a distributable surplus of £53,000, which is equivalent to earnings of about 24 per cent gross on the present capital. The shares offer a prospective yield of over 7¾ per cent.

REPORTS and DIVIDENDS

Strand Electric Holdings, Ltd.—The main figures in the accounts for the year to 30th April last were given in our issue of 19th September. In his circulated statement, Mr. J. D. H. Sheridan (chairman and joint managing director) says that his forecast in his previous statement that the turnover of the work and sales departments was likely to fall proved correct, but the reduction in the combined net profit of these departments was much smaller than expected. The results of the signs department, the Dublin and Melbourne branches and one of the subsidiaries, Tyler & Freeman, Ltd., were not up to expectations, but the total reduction in respect of these was substantially outweighed by the improved results of the hire and contract departments, the Manchester branch and the other subsidiary company, Implitico, Ltd. In addition, it proved possible to effect considerable economies in administrative costs which also contributed to the improved group result. The board has in mind the possibility of an interim payment in future years. Mr. Sheridan mentions that orders have been executed for their lighting control equipment for television studios in Yugoslavia, Brazil and Germany. With regard to the future, business is satisfactory in most departments and the indications are that improvement is probable.

John I. Thornycroft & Co., Ltd.—The accounts for the year ended 31st July last show a consolidated trading balance of £413,207, as compared with £826,760 for the preceding year. Taxation absorbs £203,056, and the net profit is £210,151 (against £433,443). It is proposed to pay a final dividend of 4 per cent (against 9 per cent), making 7½ per cent (12½ per cent) for the year. In addition, it is proposed to pay a dividend of 1 per cent from capital profits not subject to tax. The balance carried forward in the profit and loss account is £588,574, and in the capital profits account £12,750.

Contactor Switchgear, Ltd., reports profits for the year to 31st July last of £179,699, as compared with £164,250 for 1956-57. Taxation requires £95,236 and the net balance is £84,463 (against £76,698). General reserve receives £60,000 and it is proposed to pay a final dividend of 10 per cent, making 14 per cent for the year (against 20 per cent), on capital increased by a one-for-two scrip issue. The balance carried forward is £13,057 (against £12,744 brought in).

The Electrical Apparatus Co., Ltd., reports that after providing £170,700 for taxation, the net profit for the year to 31st July last is £174,000. It is proposed to pay a final dividend of 10 per cent, making 14½ per cent for the year on doubled capital. The total distribution for the preceding year was 16 per cent, of which the final dividend was paid on the present capital.

The Power Investment Corporation, Ltd., has declared an interim dividend of 4 per cent (against 3 per cent). It is stated that the increase is to reduce the disparity with the final dividend.

Cable & Wireless (Holding), Ltd., has announced a third interim dividend of 2½ per cent (unchanged).

The Ever Ready Co. (Great Britain), Ltd., has declared an interim dividend of 5 per cent (unchanged).

Simms Motor & Electronics Corporation, Ltd., has announced an interim dividend of 5 per cent (against 10 per cent), on trebled capital.

New Companies

Thompson Electrical Co. (Kenilworth), Ltd.—Registered 13th October. Capital £10,000. Electrical installation specialists, etc. Directors: J. Thompson and E. F. Walton. Regd. office: Manor Road, Kenilworth, Warwicks.

Pemek Electrical Services, Ltd.—Registered 19th September. Capital £100. To acquire the business of Pemek Electrical Services carried on at King's Cross, N.1; to carry on the business of manufacturers of and dealers in electrical and electronic equipment, etc. Directors: H. A. Ashmore and Ann G. Ashmore. Regd. office: 161, Caledonian Road, N.1.

Frederick Williams (Appliances), Ltd.—Registered 17th September. Capital £100. Manufacturers and dealers in radio, television and electrical apparatus, appliances, etc. D. P. Papillon signs as director. Regd. office: Bracken Place, Upper Bassett, Southampton.

Dermik Electronics, Ltd.—Registered 7th October. Capital £100. To install, develop and operate radio and television relay equipment and all other electrical apparatus and equipment, etc. Directors: M. W. A. Howell and Patricia H. Howell. Regd. office: 89, Leopold Street, Birmingham, 12.

Pollins Radio, Ltd.—Registered 16th September. Capital £3,000. Manufacturers of and dealers in radio, electrical and mechanical apparatus, etc. Directors: R. I. Pollins and I. D. Kaizer. Regd. office: 111, Moorgate, E.C.2.

Kiloheat, Ltd.—Registered 16th September. Capital £100. Manufacturers and repairers of and dealers in electric heater batteries, fittings and appliances, etc. Director: R. E. Hutton. Regd. office: 36, Southampton Street, Strand, W.C.2.

Sir John Gallwey (Instruments), Ltd.—Registered 16th September. Capital £100. Vendors, manufacturers, designers and proprietors of meters and other instruments for measuring moisture in hygroscopic materials and registering electrical current and resistances, etc. Regd. office: 356/68, Evelyn Street, S.E.8.

Lexor Electronics, Ltd.—Registered 15th September. Capital £1,000. Designers and manufacturers of precision electronic instruments, etc. Directors: H. J. Lucas and Audrey D. Pledger. Regd. office: 211, Bradgate House, Coventry.

Revall Hayward & Co., Ltd.—Registered 15th October. Capital £2,000. To design, develop, manufacture and deal in electrical, mechanical, electronic, nuclear, atomic, heating, and other materials, machinery, etc. Directors: R. W. Hayward, H. D. Lockwood and K. Biddle. Regd. office: 197, Lewisham High Road, S.E.13.

Webb & Barker, Ltd.—Registered 1st October. Capital £7,000. Radio and television engineers, sound acoustic engineers, electrical engineers and general electrical installation contractors, etc. Directors: S. Barker and Vera Barker. Regd. office: 44/48, Wellington Road, Dewsbury.

C. A. Thornhill (Spondon), Ltd.—Registered 1st October. Capital £3,000. Electrical engineers, etc. Directors: C. A. Thornhill and Mrs. Phyllis Thornhill. Regd. office: 63, Borrowfield Road, Spondon, Derbys.

Bristol Armature Co., Ltd.—Registered 30th September. Capital £200. Electrical, mechanical, motor, constructional, and civil engineers, manufacturers and repairers of and dealers in dynamos, motors, armatures, etc. Directors: A. W. Harrison, J. M. Harrison and W. Harrison. Solicitors: Lloyd & Co., Bristol, 1.

Electric Homes, Ltd.—Registered 29th September. Capital £100. Manufacturers and distributors of, agents for and wholesale and retail dealers in electrical goods of all kinds, radio and television receivers, components, aerials and accessories, etc. B. Kennedy is first director. Solicitors: Howard Kennedy & Co., 19, Cavendish Square, W.1.

Electrotechnic (Northern), Ltd.—Registered 29th September. Capital £5,000. Electrical and electronic engineers, electrical installation contractors, radio and television engineers, etc. Directors: J. M. W. Swanson, J. Hutchinson and E. H. Foster. Regd. office: Heriot House, Summerhill Terrace, Newcastle-on-Tyne, 4.

Electromag Engineering Co., Ltd.—Registered 30th September. Capital £10,000. Electrical and mechanical engineers, manufacturers and workers of and dealers in mechanical and electrical apparatus and goods, etc. Directors: L. R. Neil, M. H. Gamble and P. W. H. Bomford. Regd. Office: Bysouth Works, Dorset Road, South Tottenham, N.15.

D. & M. Stewart (London), Ltd.—Registered 30th September. Capital £500. Manufacturers, importers and exporters of and dealers in electrical and domestic appliances of all kinds, including television and radio sets, refrigerators, etc. Directors: Doreen Stewart and M. Stewart. Regd. office: 2/10, St. Johns Road, Clapham Junction, S.W.11.

Gibsons Electrics (Accrington), Ltd.—Registered 9th October. Capital £500. Hirers out on rent or hire purchase, manufacturers of and dealers in electrical appliances, goods and equipment, radio and television sets, etc. Directors: J. W. Farran, T. Gibson, Elizabeth Farran and Kathleen Gibson. Regd. office: 187, Blackburn Road, Accrington, Lancs.

Increases of Capital

British Relay Wireless & Television, Ltd.—Increased by £500,000 in 5s ordinary shares, beyond the registered capital of £2,000,000.

L. Sterne & Co., Ltd.—Increased by £300,000 in £1 ordinary shares, beyond the registered capital of £540,000.

Liquidations

Rogers & Kirkby, Ltd., electrical contractors, 14, Christchurch Road, Bournemouth.—Winding up voluntarily. Liquidator, Mr. A. L. H. Ball, 14, Christchurch Road, Bournemouth, appointed 13th October.

F. J. Coleman (Electrical Contractors), Ltd. (creditors' voluntary liquidation).—Particulars of claims by 7th November to the liquidator, Mr. N. Osborne, Bank Chambers, 1, John Street, Bedford Row, London, W.C.1.

H.G.B. Electronics, Ltd. (in voluntary liquidation).—Final meetings of members and creditors on 21st November at the offices of W. H. Cork, Gully & Co., 19, Eastcheap, London, E.C.3, to receive an account of the winding-up by the liquidator, Mr. K. R. Cork.

Bankruptcy

T. Evans, 25, North Parade, Aberystwyth, trading as Tom Evans Electricals, electrical engineer.—Last day for receiving proofs for dividend 4th November. Trustee, Mr. G. H. Down, 106, Walter Road, Swansea.

NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged.

Monday, 3rd November

BIRMINGHAM.—James Watt Memorial Institute, 6 p.m. I.E.E. South Midland Centre. "Some Impressions of Technical and Industrial Training in the United States," by Dr. K. R. Sturley.

BOLTON.—Railway Hotel, Trinity Street, 7.45 p.m. A.S.E.E. Bolton Branch. "Silicones in the Electrical Industry," by H. T. Lofthouse.

CHELTENHAM.—Rotunda, 7.30 p.m. Society of Instrument Technology, Cheltenham Section. "Instruments for Guided Flight," by G. G. Roberts.

CHESTER.—Grosvenor Hotel, 7 p.m. I.E.E. Mersey and North Wales Centre. Annual dinner.

HULL.—Yorkshire Electricity Board, Ferensway, 6.30 p.m. I.E.S. Leeds Centre. "Australian Journey," by W. E. Harper.

ILFORD.—Angel Hotel, 8 p.m. A.S.E.E. North East London Branch. Film of the 1958 Electrical Engineers' Exhibition, with an introductory talk by P. A. Thorogood.

LEEDS.—Great Northern Hotel, 7.30 p.m. A.S.E.E. Leeds Branch. "Floor Warming," by D. Stretton-Smith.

LONDON. — Caxton Hall, S.W.1, 7 p.m. E.P.E.A. London Technical Group. "Space Heating by Floor Warming," by J. Dunwoody.

MAIDSTONE.—Technical College, 7 p.m. I.E.E. District meeting. "Operational Experience at Calder Hall," by K. L. Stretch.

NEWCASTLE-UPON-TYNE. — King's College, 6.15 p.m. I.E.E. North Eastern Radio and Measurement Group. "Some Case Histories of Business Computers in the U.S.A.", by Dr. A. T. Starr.

County Hotel, Neville Street, 6.30 p.m. North East Electrical Club. "High Voltage Cables," by P. W. Cave.

SHEFFIELD.—Royal Victoria Hotel, Sheffield, 7.30 p.m. A.S.E.E. Sheffield Branch. "Earth Leakage and Circuit-Breakers," by J. A. Robbins.

Tuesday, 4th November

BELFAST.—College of Technology, 7.30 p.m. Institute of Marine Engineers, Northern Ireland Panel. "Nuclear Steam Propulsion for Merchant Ships," by W. R. Wootton.

CAMBRIDGE.—Cavendish Laboratory, Free School Lane, 8 p.m. I.E.E. Cambridge Radio and Telecommunication Group. Section chairman's address, "Random Thoughts of a Propagation Engineer," by G. Millington.

EDINBURGH.—Carlton Hotel, North Bridge, 7 p.m. I.E.E. South East Scotland Sub-Centre. "Speed Control of Large Wind Tunnels, with particular reference to the R.A.E. 8ft x 8ft High Speed Wind Tunnel," by L. S. Drake, J. A. Fox and G. H. A. Gunnell.

25, Charlotte Square, 7 p.m. Incorporated Plant Engineers, Edinburgh Branch. "Engineering Specifications," by M. F. Barker.

GLASGOW.—Royal College of Science and Technology, George Street, 7 p.m. I.E.E. South West Scotland Sub-Centre. "Operating Experience with a Transistor Digital Computer," by R. C. M. Barnes and Dr. J. H. Stephen, and "A Basic Transistor Circuit for the Construction of Digital-Computing Systems," by P. L. Cloot.

HAMMERSMITH. — Windsor Castle Hotel, 134, King Street, 7.30 p.m. A.S.E.E. West London Branch. Film of 1958 Electrical Engineers' Exhibition.

LEEDS.—C.E.G.B. Offices, 6.30 p.m. I.E.E. North Midland Centre. "The Design of the 330 kV Transmission System for Rhodesia," by F. C. Winfield, T. W. Wilcox and G. Lyon.

LONDON.—Savoy Place, 5.30 p.m. I.E.E. Measurement and Control Section. "Operating Experience with a Transistor Digital Computer," by R. C. M. Barnes and Dr. J. H. Stephen, and "A New High-Speed Digital Technique for Computer Use," by D. Eldridge.

Great George Street, Westminster, S.W.1, 5.30 p.m. Institution of Civil Engineers. Presidential address, by Professor A. J. S. Pippard.

At the Royal Society of Arts, John Adam Street, Adelphi, Strand, 7 p.m. Incorporated Plant Engineers. "Operational Research and the Plant Engineer," by G. D. Jordan.

LOUGHBOROUGH. — Loughborough College, 6.30 p.m. I.E.E. East Midland Centre. "Earthing of Low- and Medium-Voltage Distribution Systems and Equipment," by F. Mather.

MAIDSTONE.—Royal Star Hotel, 7.30 p.m. A.S.E.E. West Kent Branch. "Electric Floor Warming," by K. W. Ballamy.

MANCHESTER.—Engineers' Club, 17, Albert Square, 6.15 p.m. I.E.E. North Western Centre. "Results of Full-Scale Stability Tests on the British 132 kV Grid System," by Dr. Ing. F. Busemann and W. Casson, and "The Organisation for Large-Scale Grid System Tests," by Dr. F. H. Last, E. Mills and N. D. Norris.

NEWCASTLE-UPON-TYNE. — Crown Hotel, 7.30 p.m. A.S.E.E. Tyneside Branch. "Television Applied to Industry."

PETERBOROUGH.—White Lion Hotel, Church Street, 7.30 p.m. Incorporated Plant Engineers, Peterborough Branch. "The Clean Air Act," by J. Hall.

READING.—Electricity Board Demonstration Room, Market Square, 7.15 p.m. A.S.E.E. Reading and District Branch. "Radio Interference Suppression," by A. C. F. Leadbetter.

Wednesday, 5th November

BIRMINGHAM.—James Watt Memorial Institute, Great Charles Street, 7 p.m. Junior Institution of Engineers, Midland Section. "Industrial Lighting," by Mr. MacCarthy.

DUNDEE. — New Imperial Hotel, Tally Street, 7.30 p.m. Institution of Production Engineers, Scottish Region. "Powder Metallurgy," by G. R. Bell.

EDINBURGH.—Carlton Hotel, North Bridge, 7 p.m. I.E.E. South-East Scotland Sub-Centre. "Operating Experience with a Transistor Digital Computer," by R. C. Barnes and Dr. J. H. Stephen, and "A Basic Transistor Circuit for the Construction of Digital-Computing Systems," by P. L. Cloot.

Y.M.C.A., 14, South St. Andrew Street, 6.30 p.m. I.E.S. Edinburgh Centre. "Problems Associated with Luminaire Installation Practice in Mining," by W. B. Bell.

LEICESTER.—Bell Hotel, 7 p.m. Incorporated Plant Engineers, Leicester Branch. "Thermo Plastics with special reference to the use of Nylon in Industry," by C. C. Morgan.

LONDON.—I.E.E. London Graduate and Student Section. 2.15 p.m. Visit to Post Office Research Station, Dollis Hill, N.W.2.

MANCHESTER. — Engineers' Club, Albert Square, 7 p.m. A.S.E.E. Manchester Branch. "Electricity and the Fire Risk," by Station Officer Thorp.

MIDDLESBOROUGH. — Cleveland Scientific and Technical Institute, Corporation Road, 6.30 p.m. I.E.E. Tees-Side Sub-Centre. "The Design of the 330 kV Transmission System for Rhodesia," by F. C. Winfield, T. W. Wilcox and G. Lyon.

NEWCASTLE-UPON-TYNE.—Lecture Theatre, Grey Hall, Department of Electrical Engineering, King's College, College Road, 6.15 p.m. I.E.S. Newcastle-upon-Tyne Centre. Members' night.

PRESTON.—R.A.F.A. Club, East View, 7.30 p.m. A.S.E.E. Preston Branch. "Which Switch?" by B. C. Skinner.

SOUTHAMPTON.—The University, 7 p.m. I.E.E. Southern Centre. "The Use of Transistors in Radio and Television," by E. Wolfendale.

WOOD GREEN.—Town Hall, N.22, 7.45 p.m. A.S.E.E. North London Branch. "Modern Developments in Fluorescent Lighting," by G. V. McNeill.

Wednesday, 5th November, to Friday, 7th November

MANCHESTER.—At the Manchester College of Science and Technology, Sackville Street. Conference on Fuel and Power in British Industry.

Thursday, 6th November

CARDIFF.—South Wales Electricity Board, The Hayes, 6 p.m. I.E.S. Cardiff Centre. "The Optician's Approach to Lighting," by K. Edwards.

CHATHAM. — Medway College of Technology, 7 p.m. I.E.E. London Graduate and Student Section. District meeting. Chairman's address by J. F. Outram.

CHELMSFORD.—Crompton's Social Hall, 7.30 p.m. Chelmsford Engineering Society. "The Stabilisation of Ships against rolling, with particular reference to Roll Sensing and Control Equipment," by J. Bell.

EDGBASTON.—Botanical Gardens. I.E.S. Birmingham Centre. Ladies' night.

EXETER.—S.W.E.B. Showrooms, Bedford Street, 3 p.m. I.E.E. South-Western Sub-Centre. "Domestic High-Fidelity Sound Reproduction," by J. Moir.

GLASGOW.—29, St. Vincent Place, 6.30 p.m. I.E.S. Glasgow Centre. "Problems Associated with Luminaire Installation Practice in Mining," by W. B. Bell. (Joint meeting with A.M.E.M.E. West of Scotland Branch.)

LONDON.—Savoy Place, 5.30 p.m. Institution of Electrical Engineers. "The Recognition of Moving Vehicles by Electronic Means," by T. S. Pick and A. Readman.

Criterion, Piccadilly, W.1. Plastics Institute, London and District Section. Annual luncheon.

MANCHESTER.—North Western Electricity Board, Town Hall Extension, 6 p.m. I.E.S. Manchester Centre. "Links Between Colour and Lighting in Buildings," by H. L. Gloag.

RUGBY.—Masonic Hall, 7.30 p.m. I.E.E. Rugby Sub-Centre. Annual dinner.

SOUTHAMPTON.—Chandler's Ford, 7.30 p.m. Incorporated Plant Engineers, Southern Branch. A demonstration under workshop conditions of electric welding with explanatory talk.

Friday, 7th November

BRISTOL.—Grand Hotel, 8 p.m. A.S.E.E. Bristol and West of England Branch. "Electrostatic Precipitation," by A. H. Thom.

COVENTRY.—Hotel Leofric. Incorporated Plant Engineers, Birmingham Branch. Dinner-dance.

EXETER.—Social Centre for the Blind, South Street, 2.30 p.m. Association of Public Lighting Engineers, South Western Section. Installation of chairman (Mr. S. Hartland) followed by "Exeter Street Lighting," by T. Brierley.

GILLINGHAM. — Central Hotel, Watling Street. Incorporated Plant Engineers, Kent Branch. Annual dinner and dance.

LIVERPOOL. — M.A.N.W.E.B., Paradise Street, 7.30 p.m. A.S.E.E. Liverpool and District Branch. "Lubricating Oils and Greases and their Application to Industry," by G. Stott.

LONDON. — Caxton Hall, Westminster, S.W.1, 6.30 p.m. E.P.E.A. Meter Engineers' Technical Group. "Meter Calibration Recording Equipment," by H. J. Lovegrove.

SALTBURN.—Zetland Hotel. I.E.E. Tees-Side Sub-Centre. Annual dinner.

Saturday, 8th November

LONDON.—Carlton Rooms, 140, Maida Vale, W.9, 7 p.m. Graduate and Student Sections of the I.E.E., the I.Mech.E., and I.C.E. Dance.

A.S.E.E. South London Branch. Visit to B.O.A.C., London Airport.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2

1953

8794. Postmaster General.—Time division multiplex communication systems. 19th November, 1954. (803509.)

1954

11274. Hutchings, E. L.—Electric sleeve connectors. 20th April, 1955. (803640.)

14242. Siemens Edison Swan, Ltd.—Automatic regulation of electric convertors. 5th August, 1955. (803641.)

15896. English Electric Co., Ltd.—Electric stabilising circuit arrangements. 27th May, 1955. (803581.)

16558. Cossor, Ltd., A. C.—Receiving arrangements for colour television. 19th April, 1955. (803582.)

23120. Thompson Water Tube Boilers, Ltd., J.—Steam generators. 2nd February, 1955. (803548.)

27966. Benjamin Electric, Ltd. (Benjamin Electric Manufacturing Co.).—Lighting fittings. 10th August, 1955. (803781.)

28591. Electric & Musical Industries, Ltd.—Electronic storage devices. 28th September, 1955. (803512.)

35248. Pye, Ltd.—Switching arrangements. 6th December, 1955. (803513.)

35250. Pye, Ltd.—Telephone answering machines. 6th December, 1955. (803514.)

1955

2061. Mullard Radio Valve Co., Ltd.—Semiconductive devices. 24th January, 1955. (803583.)

4232. Mavor & Coulson, Ltd.—Time limit overload switch device. 12th February, 1955. (803729.)

4386. Yardney International Corporation.—Electrodes for electric cells. 14th February, 1955. (803645.)

11698. Standard Telephones & Cables, Ltd.—Electric bi-stable circuits. 22nd April, 1955. (803613.)

13588. Smith & Sons (England), Ltd., S.—Speed-responsive electrical switching devices. 10th May, 1956. (803614.)

15004. Siemens-Schuckertwerke A.G.—Induction motor driving systems for adjusting the positions of movable objects. 24th May, 1955. (803550.)

15209. Igranic Electric Co., Ltd.—Electrical control systems. 26th May, 1955. (803615.)

17937. Felten & Guilleaume Fernmeldeanlagen G.m.b.H.—Circuit for the simultaneous amplification of a frequency band and of a signal frequency outside the said band. 21st June, 1955. (803662.)

18308. Hollins, J. R.—Thermostatically operated time delay switches. 24th June, 1955. (803588.)

18920. Rank Cintel, Ltd.—Cathode-ray display tubes. 2nd July, 1956. (803663.)

19255. Babcock & Wilcox, Ltd.—Methods of and apparatus for ultrasonically testing welds. 3rd July, 1956. (803551.)

22148. Eitel-McCullough, Inc.—Electron tubes. 2nd August, 1955. (803665.)

23225. Parsons & Co., Ltd., C. A.—Nuclear reactors. 18th October, 1956. (803701.)

25135. Porter Electrical Products, Ltd.—Clamp for electric conductors. 10th August, 1956. (Addition to 746180.) (803465.)

26546. English Electric Co., Ltd.—Automatic voltage regulating systems. 17th September, 1956. (803527.)

28098. Oak Mfg. Co.—High frequency apparatus. 9th March, 1955. (Divided out of 803653.) (803654.)

30390. Powers - Samas Accounting Machines, Ltd.—Electronic digital computing machines. 11th September, 1956. (803733.)

33730. General Electric Co., Ltd.—Refrigerator condensers. 20th November, 1956. (803759.)

33876. Siemens Edison Swan, Ltd.—Timing arrangements. 15th November, 1956. (803705.)

34432. Metropolitan-Vickers Electrical Co., Ltd.—Mass spectrometers. 15th November, 1956. (803742.)

37211. Allmänna Svenska Elektriska A.B.—Means for the grid control of a convertor. 29th December, 1955. (803786.)

37450. General Electric Co.—Velocity modulated electron discharge devices. 30th December, 1955. (803709.)

37523. Rolls-Royce, Ltd.—Nuclear reactor control mechanisms. 31st December, 1956. (803708.)

1956

3180. Rank Cintel, Ltd.—Television and sound broadcast receivers. 25th January, 1957. (803620.)

3834. Crompton Parkinson, Ltd.—Plates for lead-acid secondary batteries. 6th March, 1957. (803488.)

6178. Metropolitan-Vickers Electrical Co., Ltd.—Vacuum apparatus. 28th February, 1957. (803712.)

6193. Clarke, Chapman & Co., Ltd.—Tubular heat exchangers. 28th May, 1957. (803491.)

11313. Western Electric Co., Inc.—Electromagnetic wave devices. 13th April, 1956. (803621.)

11537. Brown Boveri & Cie. A.G.—Air blast circuit-breaker with auxiliary interrupter for parallel resistors. 16th April, 1956. (803714.)

15135. Time, Inc.—Electrical amplitude modulating circuits. 15th May, 1956. (803682.)

15518. Foster Transformers, Ltd., and Jennings, R. E.—A.c. arc welding systems. 10th May, 1957. (Addition to 769433.) (803534.)

16246. Teletype Corporation.—Telegraph system. 25th May, 1956. (803716.)

20724. General Electric Co.—Incandescent electric lamps. 4th July, 1956. (803536.)

22071. General Motors Corporation.—Compression refrigerator apparatus and methods of operating same. 17th July, 1956. (803564.)

23218. Rhee Elastic Thread Corporation.—Covered thread and electric conductors covered therewith. 27th July, 1956. (803499.)

23255. Erie Resistor Corporation.—Capacitor. 27th July, 1956. (803684.)

24570. British Thomson-Houston Co., Ltd.—Methods of zone heating materials. 12th August, 1957. (803746.)

27296. Scholes & Co., Ltd., G. H., Pearce, F. J., and Pearce, G. S.—Two-way electric switches. 4th July, 1957. (803604.)

29350 and 38183. Allmänna Svenska Elektriska A.B.—Air blast circuit-breaker. 25th September and 14th December, 1956. (803628 and 803748.)

30522. Toledo Scale Co.—Anti-vortex device for dishwashing machines. 6th October, 1956. (803629.)

30963. Böhler & Co. A.G., GEB.—Coated welding electrode. 11th October, 1956. (803721.)

33413. Bendix Aviation Corporation.—Analogue to digital conversion system. 1st November, 1956. (803606.)

37951. Philips Electrical Industries, Ltd.—Slag-forming masses and electrodes for use with electric arc welding. 12th December, 1956. (803607.)

1957

762. Bendix Aviation Corporation.—Quadrantal error correcting means for magnetic antennas. 8th January, 1957. (Addition to 772998.) (803608.)

1057. Stichting Reactor Centrum Nederland.—Nuclear reactor plant. 10th January, 1957. (803569.)

1746. Standard Telephones & Cables, Ltd.—Dry plate rectifier assembly. 17th January, 1957. (803570.)

2138. Baumgartner, F.—Multi-purpose electric domestic appliance. 21st January, 1957. (803693.)

3127. Philips Electrical Industries, Ltd.—Electric discharge tubes. 29th January, 1957. (803609.)

3385. Horstman, Ltd.—Electrically driven clippers for hair, fibres and the like. 15th March, 1957. (803610.)

6752. Philips Electrical Industries, Ltd.—Switching arrangements. 28th February, 1957. (803578.)

6835. Eaton Manufacturing Co.—Electromagnetic eddy current couplings. 1st March, 1957. (803505.)

11202. Bird & Sons, Ltd., S. S.—Radio frequency tuning devices. 5th April, 1957. (803633.)

17841. Standard Telephones & Cables, Ltd.—Methods of spot welding. 5th June, 1957. (803636.)

1958

10917. Postmaster General.—Time division multiplex communication systems. 19th November, 1954. (Divided out of 803509.) (803510.)

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to the dates mentioned:—

8th November

MAKEUR. No. 771,859. Class 9. Electrically operated appliances for removing and applying facial toilet preparations.—A. F. R. Peyron, Paris, France. Address for service, c/o Peter Dew, c/o Seprol, Ltd., 62, Dean Street, London, W.1.

No. 775,025 (design). Class 9. Electrical apparatus and instruments and parts.—Busch-Jaeger Dürener Metallwerke Akt.-Ges., Ludenscheid, Germany. Address for service, c/o D. Young & Co., 10, Staple Inn, London, W.C.1.

SARO (design). No. 778,438. Class 9. Electrical and electronic apparatus and instruments, radio apparatus, radio location apparatus, and parts; but not including apparatus and instruments for use in controlling temperatures of heated appliances.—Saunders-Roe, Ltd., Osborne, East Cowes, I. of W.

SYLVA-LUME. No. 773,987. Class 11. Electric lamps, lighting fittings therefor and louvres being parts of lighting installations.—Thorn Electrical Industries, Ltd., 105 to 109, Judd Street, London, W.C.1.

TEMPUNIT. No. 778,355. Class 11. Thermostatically controlled heating apparatus, and parts.—Techne (Cambridge), Ltd., Temple Mill, Duxford, Cambridge.

15th November

A.E.I. (design). No. 765,356. Class 7. Machines for the production of electrical energy, and electrically operated machines; and parts.—Associated Electrical Industries, Ltd., Crown House, Aldwych, London, W.C.2.

TWINLUVE. No. 777,103. Class 11. Electric lighting fittings, and parts.—Thorn Electrical Industries, Ltd., 105 to 109, Judd Street, London, W.C.1.

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for safety in the home

Dimensions 5½"x3½"x2¼"

The new SIEMENS EDISWAN 15 amp. earth leakage circuit breaker is designed to give earth leakage protection on 250v. sub circuits supplying domestic apparatus. Compact and straightforward in design, the Type ET.15D is voltage operated and complies with B.S.842/1939 requirements.

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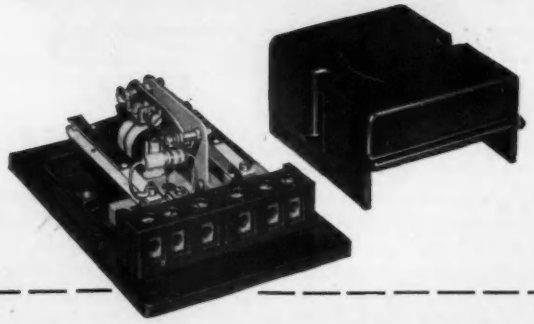

Full details on request from:

SIEMENS EDISON SWAN LTD

Distribution Equipment Division
38-39 Upper Thames Street, London E.C.4
Telephone: CENtral 2332
Telegrams: Sieswan Cent London

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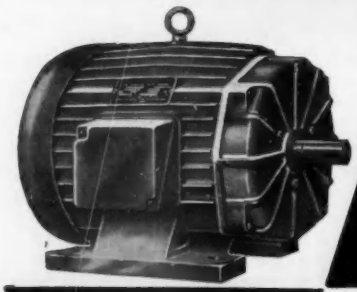

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N28

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Antrim.—County Education Committee. 17th November. Electrical installation in new intermediate school, Ballymoney. Barrett & Agnew, consulting engineers, 420, Ravenhill Road, Belfast.

Burma.—Burma Purchase Board, Rangoon. 10th November. Lead covered twin cable. (E.S.B. 25428/58. Ten/35243.)* Copper and enamelled copper wire. (E.S.B. 25430/58. Ten/35244.)* 11th November. G.I. projection lamps. (E.S.B. 25859/58. Ten/35343.)* 13th November. Fluorescent tubes and fittings. (E.S.B. 25921/58. Ten/35314.)* Plugs and sockets, connectors, ceiling roses, electric lamps and indicators. (E.S.B. 25926/58. Ten/35316.)* Cable and copper wire. (E.S.B. 25927/58. Ten/35309.)* 17th November. Porcelain insulators. (E.S.B. 25929/58. Ten/35315.)*

Canada.—Manitoba Hydro-Electric Board, Winnipeg. 19th November. 138 kV disconnecting switches for Kelsey power station. (E.S.B. 25783/58. Ten/35275.)*

Castlederg (Co. Tyrone).—12th November. Electrical installation in new voluntary intermediate school. Varming & Mulcahy, consulting engineers, 37, Malone Road, Belfast.

Castleford.—Borough Council. 15th November. 34 class "A" lighting points along the Pontefract Road. Borough engineer, Town Hall.

Ceylon.—Tender Board, Ministry of Land and Development, Colombo. 9th December. Generating sets (6 kVA, 12 kVA and 30 kVA). (E.S.B. 25773/58. Ten/35380.)*

Cornwall.—County Council. Electrical services for new county secondary school, St. Austell. (See this issue.)

Crossgar (Co. Down).—7th November. Electrical installation in intermediate school. Varming & Mulcahy, 37, Malone Road, Belfast.

Down.—County Education Committee. 13th November. Electrical installation in Newry Secondary Intermediate School. J. R. W. Murland, consulting engineer, 13, Wellington Place, Belfast.

Edinburgh.—North of Scotland Hydro-Electric Board. Electrical services for Braco substation. (See this issue.)

Fermanagh.—County Education Committee. 12th November. Electrical installation in extension of the Collegiate School, Enniskillen. J. Malone, chief education officer, Education Offices, Enniskillen.

Greece.—State Procurement Service, Athens. 11th November. Cables. (E.S.B. 25771/58. Ten/35297.)* 12th November. Copper wire, insulators, brackets, telephone apparatus and batteries. (E.S.B. 26100/58. Ten/35366.)*

Heywood.—Corporation. 5th December. Electrical installations in 16 dwellings. (See this issue.)

India.—Madras Port Trust. 10th December. L.v. underground distribution cables. (E.S.B. 25707/58. Ten/35270.)*

Madras State Electricity Board. 19th November. L.v. insulators. (E.S.B. 25970/58. Ten/35351.)*

Iran.—Iranian State Railways, Teheran. 26th November. 45 electro-pumps. (E.S.B. 26087/58. Ten/35391.)* 1st December. Five turbine pumps for deep wells. (E.S.B. 26088/58. Ten/35392.)*

Plan Organisation, Teheran. 1st December. Pumping equipment for three water pumping stations. (E.S.B. 25799/58. Ten/35331.)*

Irvinestown (Co. Fermanagh). — 28th November. Electrical installation in new intermediate school. C. P. McNally, 143, Royal Avenue, Belfast.

Londonderry (Belmont).—Northern Ireland Housing Trust. 11th November. Electrical installations in 216 dwellings. Offices of the Trust, 12, Hope Street, Belfast.

Mitcham.—Corporation. 8th November. Street lighting equipment. (See this issue.)

Newburn. — U.D.C. 28th November. Street lighting equipment. (See this issue.)

New Zealand.—Auckland Electric Power Board. 21st November. Five 750 kVA transformers. (E.S.B. 25877/58. Ten/35323.)*

Skipton.—U.D.C. 17th November. Trunk road lighting equipment. (See this issue.)

South Africa.—Stores Department, South African Railways, Johannesburg. 5th November. 5-panel l.v. switchboard. (E.S.B. 25794/58. Ten/35287.)* Telephone switchboards. (E.S.B. 25796/58. Ten/35327.)* 14th November. Lighting fittings. (E.S.B. 26148/54. Ten/35371.)*

Stores Department, South African Railways, Johannesburg. 14th November. Electric cable. (E.S.B. 26150/58. Ten/35369.)*

Union Tender and Supplies Board, Pretoria. 6th November. Electric soldering bolts. (E.S.B. 25243/58. Ten/35215.)*

Johannesburg City Council. 20th November. Insulating sheets. (E.S.B. 26117/58. Ten/35370.)* 6th November. Traffic signal cable. (E.S.B. 26436/58. Ten/35415.)*

Durban Electricity Department. 16th January. Switchgear for Mitchell Park substation. (E.S.B. 25767/58. Ten/35283.)*

Sudan.—Controller of Stores, Ministry of Works, Khartoum. 15th November. Ceiling and table fans. (E.S.B. 26021/58. Ten/35350.)*

Thailand.—Post and Telegraph Department, Bangkok. 13th November. Three 50-55 kVA diesel generating sets. (E.S.B. 25973/58. Ten/35334.)* 17th November. Radio terminal and teleprinter equipment. (E.S.B. 25971/58. Ten/35359.)*

ORDERS PLACED

Glasgow.—Education Committee. Electrical work in secondary school at Priesthill, Site No. 3 (£17,246).—Malcolm & Allan. Electrical work in primary schools at Easterhouse, Site No. 10 (£12,890) and Site No. 20 (£12,170).—James Scott & Co. (Electrical Engineers).

London.—British Transport Commission. Power transformers for British Railways' electrification programmes in the Eastern and Scottish Regions:—Bruce Peebles & Co. (17); C. A. Parsons & Co. (8); Hackbridge & Hewittic Electric Co. (9); Crompton Parkinson (5).

Margate.—Housing Committee. Electrical work in connection with the improvement of pre-war houses (£7,197).—Watts of Wye, Ltd.

Newcastle-on-Tyne.—The Regional Hospital Board has accepted the following tenders for electrical work:—Electrical installation at new department of urology at Newcastle General Hospital (£10,104).—Veale Nixon. Electrical installation at new operating theatre, Hemlington Hospital, Middlesbrough (£3,127).— Edmundson's Construction Co. Electrical work at new annexes, Garlands Hospital, Carlisle (£702).—G. Bowman.

With reference to the notice under this heading in our issue of 17th October for electrical work at a new secondary technical school for boys, we are informed that the tender of Campbell & Isherwood was withdrawn and that the tender of Williams Bros. (Electrical), Ltd., has been accepted.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Ampthill.—County primary school at Pulloxhill; S. Goodman, county architect, Shire Hall, Bedford.

Basildon.—Branch library and community centre (£35,000); H. Conolly, Essex county architect, County Hall, Chelmsford.

Beddington (Surrey).—Flats (42); Pite, Son & Fairweather, architects to Borough Council, 6, Queen Anne's Gate, London, S.W.1.

Berwick.—Pastry factory, Tweedside trading estate; Jus-rol, Ltd., 50, Duke Street, Coldstream.

Housing estate adjoining Osborne Road; William Leech, Ltd., builders, St. James Street, Newcastle-on-Tyne.

Billingham-on-Tees.—School clinic, maternity and child welfare centre and library (£33,600); Middleton & Co., builders, Haughton-le-Skerne.

Birmingham.—Works, Windsor Street; Crossland & Deakin, Ltd., Aston Cross.

Dwellings, Birchfield Road, Handsworth (73) and Bunbury Road estate, Northfield (20); A. G. Sheppard Fidler, city architect, Civic Centre, 1.

Two blocks of flats, Calthorpe; John H. D. Madin, architect, 83/5, Hagley Road.

Arts building for University; Tersons, Ltd., builders, 4, Dollis Park, Finchley, N.3.

Blackburn.—Dwellings (60), Lincoln Street; borough engineer.

Brighton.—Flats (90), Whitehawk; planning officer, 26/30, King's Road.

First phase of scheme for College of Arts and Crafts (£136,875); D. J. Howe, borough engineer, King's Road.

Bristol.—Works, Brislington; British Process Mounting Co., Ltd., 58, Granville Street.

Burnley.—Works, Heasanford, for Michelin Tyre Co., Ltd., Stoke-on-Trent; Holland & Hannen and Cubitts, Ltd., builders, St. Mary's Road, Garston, Liverpool.

Cheadle Hulme.—Fire and ambulance stations in Turves Road (£55,000); county architect, The Castle, Chester.

Chertsey.—Children's home and new block at Botleys Park Hospital; Rider, Hunt & Partners, surveyors to Regional Hospital Board, Bridge House, Queen Victoria Street, London, E.C.4.

Cheshunt.—Factory; Lotus Engineering Co., Ltd., 7, Tottenham Lane, London, N.8.

Chester.—Church of St. Clare, Hawthorn Road, Lache; Reynolds & Scott, architects, 9, Albert Square, Manchester.

Crawley.—Factory and offices; Corocraft, Ltd., 1, Everton Buildings, Stanhope Street, London, N.W.1.

Crewe.—Bus station, garage, canteen, etc.; Crosville Motor Services, Ltd., Market Street and Queen Street, Crewe.

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

Dagenham. — Houses (79), Beamway; borough engineer, Civic Centre.

Darlington.—Houses (26), Faverdale Road area; A. Abdale, builder, Whessoe Road, Darlington.

Derby.—Erection of David Tower Hotel, Becketwell Lane (£500,000); D. Branch, architect, 6, Charterhouse Square, London, E.C.1.

Dunstable.—Works extensions for Rootes, Ltd.; Robert M. Douglas, Ltd., builders, 395, George Road, Erdington, Birmingham.

Durham.—Infants' school at Ryton (£30,000); A. Watson, Ltd., builders, Front Street, Whickham.

Eastleigh.—Houses (52), Velmore estate; E. J. Tapley, borough engineer, Town Hall.

Ellesmere Port.—Dwellings (250), North Whitby estate; Thomas Warrington & Sons, Ltd., builders, 82, Station Road.

Epping.—St. John's Church of England Secondary School; Howard V. Lobb & Partners, architects, 20, Gower Street, London, W.C.1.

Fareham.—Scheme of improvements to kitchens, Knowle Hospital (£60,811); R. Mellor, architect to South West Metropolitan Regional Hospital Board, 76, Wimpole Street, London, W.1.

Friern Barnet.—Secondary school in Crescent Road; C. G. Stillman, Middlesex county architect, 1, Queen Anne's Gate Buildings, London, S.W.1.

Gateshead.—Houses (112), Leam Lane estate; A. V. Clerey & Son, builders, 14, Frederick Street, Sunderland.

Motor car showrooms, High Street, for Metropole Motors (Glasgow), Ltd.; R. Bluck, architect, 147, Bath Street, Glasgow, C.2.

Glasgow.—Maternity hospital, Yorkhill; John L. Gleave, architect, 10, Lynedoch Crescent.

Gosport.—Sixteen-storey block of flats, South Street; borough engineer.

Hatfield.—R.C. primary school; C. Miskin & Son, Ltd., builders, Romelands, St. Albans, Herts.

High Wycombe.—Factory in Coronation Road; Osters & Fleming, 88, The Archways, Studland Street, London, W.6.

Jarrow.—Houses (224), Charles Street area; H. W. T. Perkins, borough engineer.

Loftus.—Houses (172), Easington; C. D. Taylor, architect, 41, Baxtergate, Whitby.

London.—Office block, Botolph Lane, E.C.; Ley, Colbeck & Partners, architects, Palmerston House, Bishopsgate, E.C.2.

Nurses' home for St. Bartholomew's Hospital (£386,000); Richard Costain, Ltd., builders, 111, Westminster Bridge Road, S.E.1.

Dwellings (312), Beaumont Road, Wandsworth; Clifford Culpin, architect, 39, Doughty Street, W.C.1.

Nurses' training school, Vincent Square, for Westminster Hospital; T. P. Bennett & Son, architects, 43, Bloomsbury Square, W.C.1.

Four-storey offices, 422-424, Seven Sisters Road, Stoke Newington; Edward Erdman & Co., surveyors and estate agents, 6, Grosvenor Street, W.1.

Nurses' home at St. John's Hospital, Battersea; Rider, Hunt & Partners, quantity surveyors to Regional Hospital Board, Bridge House, Queen Victoria Street, E.C.4.

Houses (514), Lambeth (1959-60 programme); F. Batterbury, borough engineer, Town Hall, Brixton Hill, London, S.W.2.

Luton.—Science block at Luton High School (£76,500); borough engineer, Town Hall.

Maidenhead.—Flats (36), Cox Green estate; borough engineer, 14, Craufurd Rise.

Manchester.—Works extensions (£450,000); General Engineering Co., Ltd., Bury Road, Radcliffe.

March.—First instalment of South District Infants' School, Burrowmoor Road; J. Eggitt & Sons, Ltd., Nene Parade, March, Cambs.

Neath.—County grammar school for boys; Gee, Walker & Slater, Ltd., builders, Coity Road, Bridgend.

Newcastle-on-Tyne.—Houses (45), Wharrier Street area; J. Twiname, Ltd., builders, Brigham, Cockermouth.

Students' hostel, Eslington Road, for King's College; Napper & Partners, architects, 56, Eldon Place, Newcastle.

Houses (108) and flats (24), Newbiggin Hall estate; city architect, 18, Cloth Market.

Northumberland.—Education Committee. Electrical installations in schools:—Ashington Hirst Park Secondary (£4,730) and Shiremoor Boys' Secondary (£1,793).—Robson & Coleman. Bedlington Grammar (£5,171).—J. Robson (Electrical). Newbiggin Secondary (£2,656).—Williams Brothers.

Nottingham.—Department of Chemistry buildings for University (£870,000); Richard Costain, Ltd., builders, 111, Westminster Bridge Road, London, S.E.1.

Departmental stores, Greyfriar Gate/Stanford Street corner site; E. Woodbourne, company architect, F. W. Woolworth & Co., Ltd., 1, New Bond Street, London, W.1.

Peterborough.—Extensions to engineering block at Technical College and first instalment of Werrington Junior Mixed and Infants' School; Joint Education Board, Bridge Street.

Southport.—Five-storey block of showrooms, offices and flats, Lord Street and Manchester Road; Cussins Development, Ltd., The Drive, Gosforth, Northumberland.

Sunderland.—Old people's hostel, Hylton Red House estate (£44,000); borough architect, Grange House, Stockton Road, Sunderland.

Taunton.—R.C. Church of St. Teresa; Stansell & Son, Ltd., builders, Billet Street.

Tewkesbury.—Secondary modern school for girls; county architect, Shire Hall, Gloucester.

Thetford.—Factory and offices; G. Williams Engineering Co., Ltd., Disraeli Road, London, N.W.10.

Thurmaston.—Extensions to Roundhill Secondary Modern School (£80,000); county architect, Leicester.

Wadhurst (Sussex).—County secondary school; county architect, County Hall, Lewes.

Walthamstow.—Block of offices and shops, Church Hill; G. Blakeley, town clerk, Town Hall, E.17.

West Ham.—Large housing scheme on 19-acre site at Carpenters Road; borough engineer, Town Hall, Stratford, E.15.

West Hartlepool.—Flats (27), in the central area; Moore & Cartwright, builders, 44, High Street, Norton, Stockton.

Weston-super-Mare.—Phase 1 of Municipal College; R. O. Harris, county architect, Park Street Offices, Taunton.

CATALOGUES AND LISTS

BATTERIES.—Two illustrated and priced catalogues covering batteries for passenger transport and commercial vehicles (PD.12B/1940) and cars, motor cycles and light commercial vehicles (AB.1910). Also a 12-page catalogue giving specifications and particulars of valve and metal rectifier battery chargers. —**Siemens Edison Swan, Ltd.,** Ponders End, Enfield, Middlesex.

BUSBAR CHAMBERS.—Leaflet giving details of a new range of busbar chambers introduced by the company.—**Astral Switchgear, Ltd.,** Alma Road, Enfield, Middlesex.

DEDUSTER.—Illustrated folder (56) describing the Series MG wet deduster and showing typical applications of the equipment.—**Dallow Lambert & Co., Ltd.,** Thurmaston, Leicester.

HEATING EQUIPMENT.—Broadsheet giving illustrations, particulars and prices of the company's range of space heating equipment, electric blankets, window de-mister and other heating devices.—**E. K. Cole, Ltd.,** 5, Vigo Street, London, W.1.

INSTRUMENTS. — Illustrated leaflet giving particulars of instruments produced by the company for use in the cable making industry.—**Addison Electric Co., Ltd.,** Bosworth Road, London, W.10.

LABORATORY EQUIPMENT. — Illustrated brochure giving particulars of various laboratory mills and a portable hot air welding gun for the erection and maintenance of thermoplastic laboratory equipment. Details of other items of laboratory equipment are also included.—**Glen Creston, Ltd.,** 41, Church Road, Stanmore, Middlesex.

LIGHTING FITTINGS.—Illustrated 32-page catalogue dealing with the "Essex" range of fluorescent lighting fittings.—**Ekco-Ensign Electric, Ltd.,** 45, Essex Street, Strand, London, W.C.2.

PHOTO-ELECTRIC EQUIPMENT.—8-page booklet illustrating and describing a recently introduced range of photo-relays and associated viewing heads and light sources.—**Elcontrol, Ltd.,** Wilbury Way, Hitchin, Herts.

RECTIFIERS.—Three information leaflets dealing with silicon rectifiers and rectifier stacks.—**Standard Telephones & Cables, Ltd.,** Edinburgh Way, Harlow, Essex.

SPACE HEATING.—Illustrated booklet giving particulars and prices of the company's range of space heating equipment and "Warm-Glow" electric blankets.—**E. K. Cole, Ltd.,** Ekco Works, Southend-on-Sea, Essex.

SPECTROMETER.—18-page illustrated catalogue (CH.241/9) describing models D186 and D187 wavelength spectrometers.—**Hilger & Watts, Ltd.,** 98, St. Pancras Way, Camden Road, London, N.W.1.

SPOT WELDER.—Leaflet illustrating and describing the BSF.1 precision bench spot welder designed for extremely fine work such as electronic valve components, filament wires, thermocouples, etc.—**Sciaky Electric Welding Machines, Ltd.,** Falmouth Road, Slough, Bucks.

STORAGE PANS.—Leaflet illustrating "642" pressed steel pans which have been specially designed for the storage of small parts and components, etc.—**Welconstruct Co., Ltd.,** Martineau Street, Birmingham, 2.

SWITCHGEAR.—44-page priced catalogue (503) illustrating and describing the company's range of switchgear, fusegear and motor control gear.—**Prentice, Ltd.,** Gelderd Road, Leeds, 12.

TELEPHONE EQUIPMENT.—24-page booklet (1214/CS) illustrated in colour and describing automatic telephone equipment for intercommunication purposes in industrial organisations.—**Automatic Telephone & Electric Co., Ltd.,** Strowger Works, Liverpool, 7.

TRANSFORMERS.—Broadsheet illustrating typical transformers which have been designed and produced by the company.—**Wardray & Co., Ltd.,** Stanley Road, Hendon, N.W.9.

VARIABLE SPEED DRIVES.—Brochure (DFC/2) dealing with a hydraulic relay speed control for the company's "F" type variable speed gears.—**Carter Gears, Ltd.,** Bradford, 3, Yorkshire.

V-BELTS.—28-page catalogue giving particulars of the "GraKnight" V-belt drives.—**Graton & Knight, Ltd.,** Warwick Road, Boreham Wood, Herts.

WIRING ACCESSORIES. — 32-page catalogue containing details and illustrations of the company's range of weatherproof plugs and sockets and cable glands.—**Clang, Ltd.,** Cricklewood, London, N.W.2.

Brochure illustrating the "Wylex" range of double pole a.c. switch fuse control units with neutral bar, available in all-insulated or metal clad enclosures.—**George H. Scholes & Co., Ltd.,** Wythenshawe, Manchester, 22.

Priced 15-page catalogue illustrating and describing the "Closegang" range of switches and switch units.—**J. A. Crabtree & Co., Ltd.,** Lincoln Works, Walsall, Staffs.

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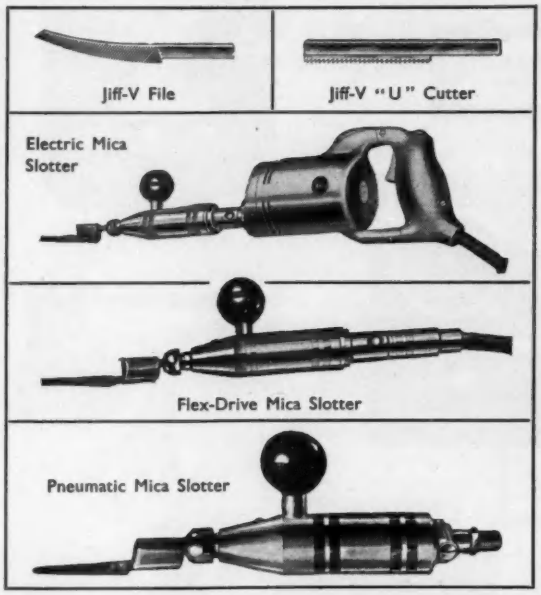

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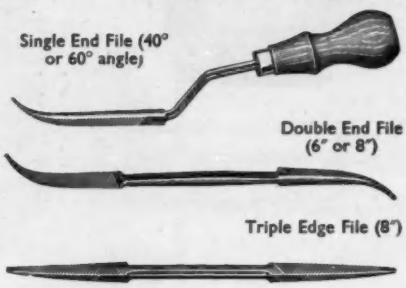

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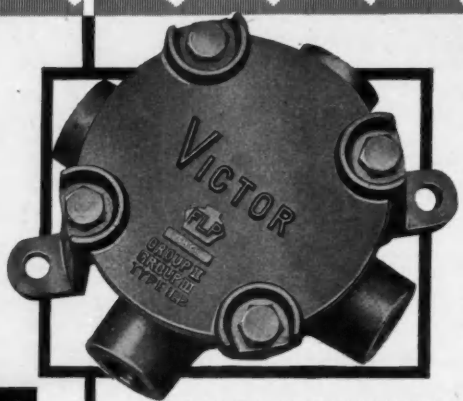

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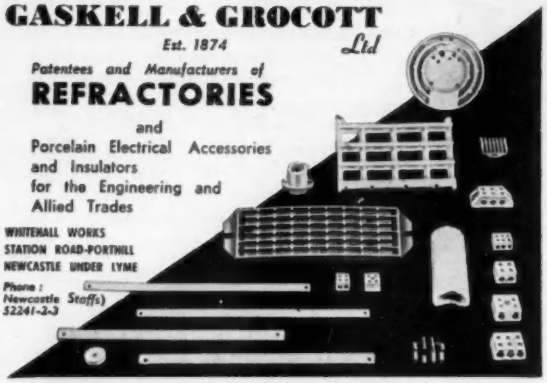

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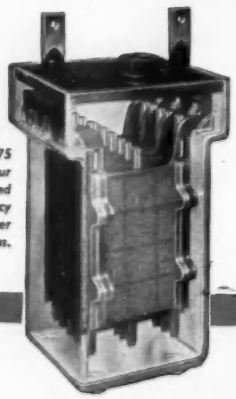

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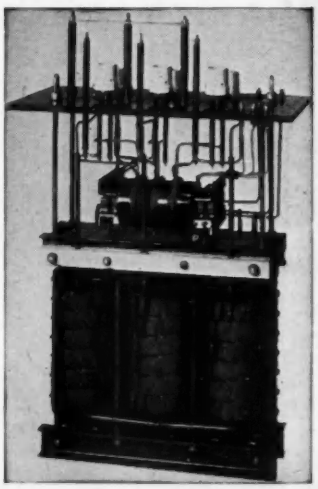

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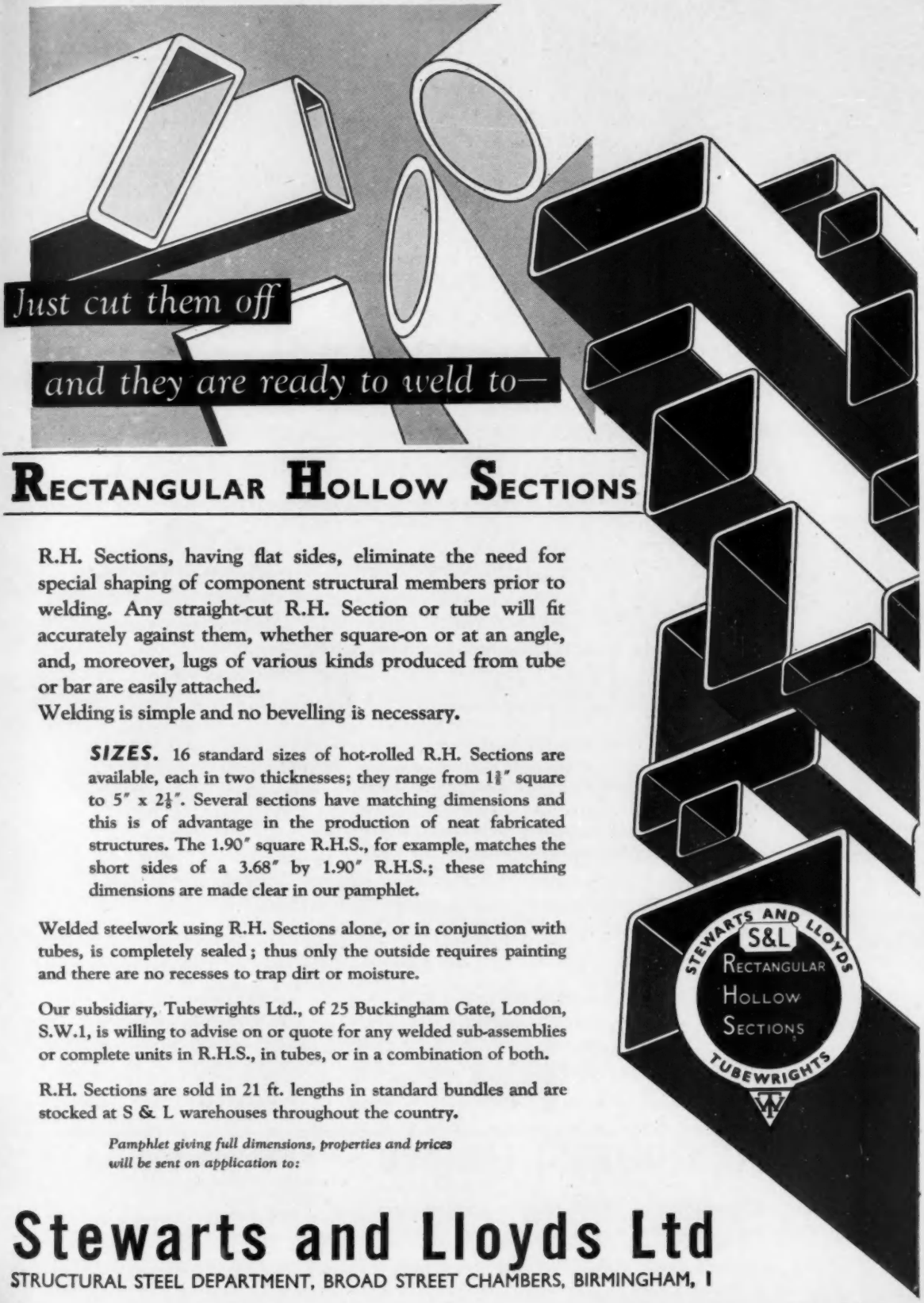

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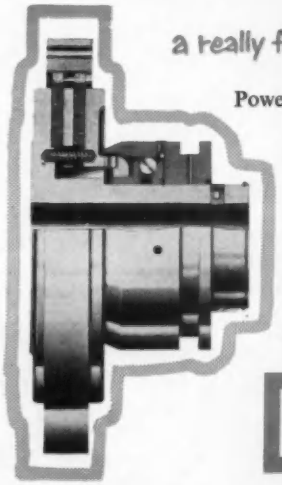

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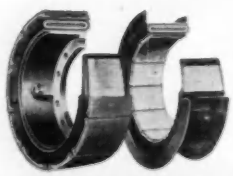

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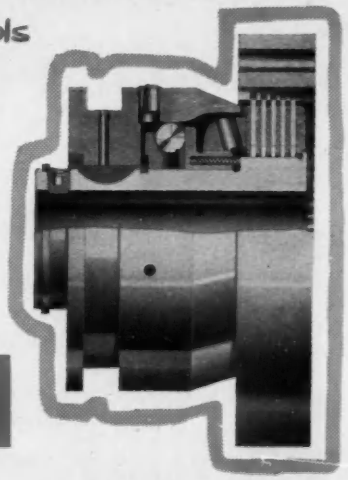

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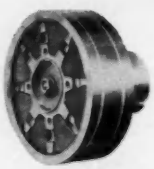

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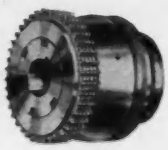

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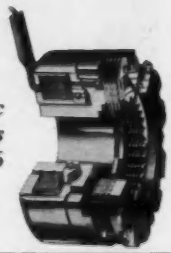

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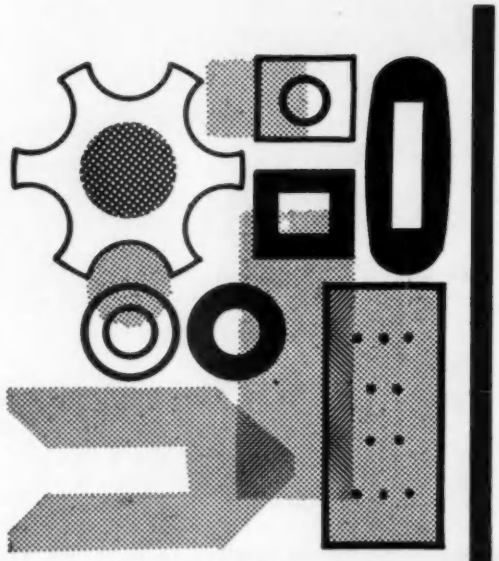

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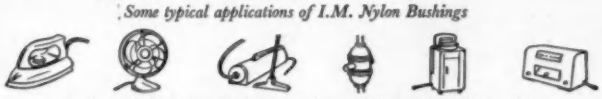

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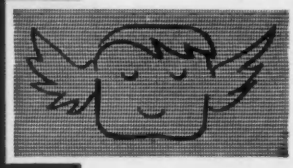
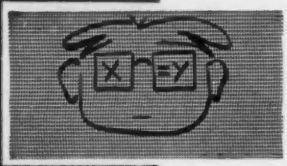


. . . fly

. . . drive



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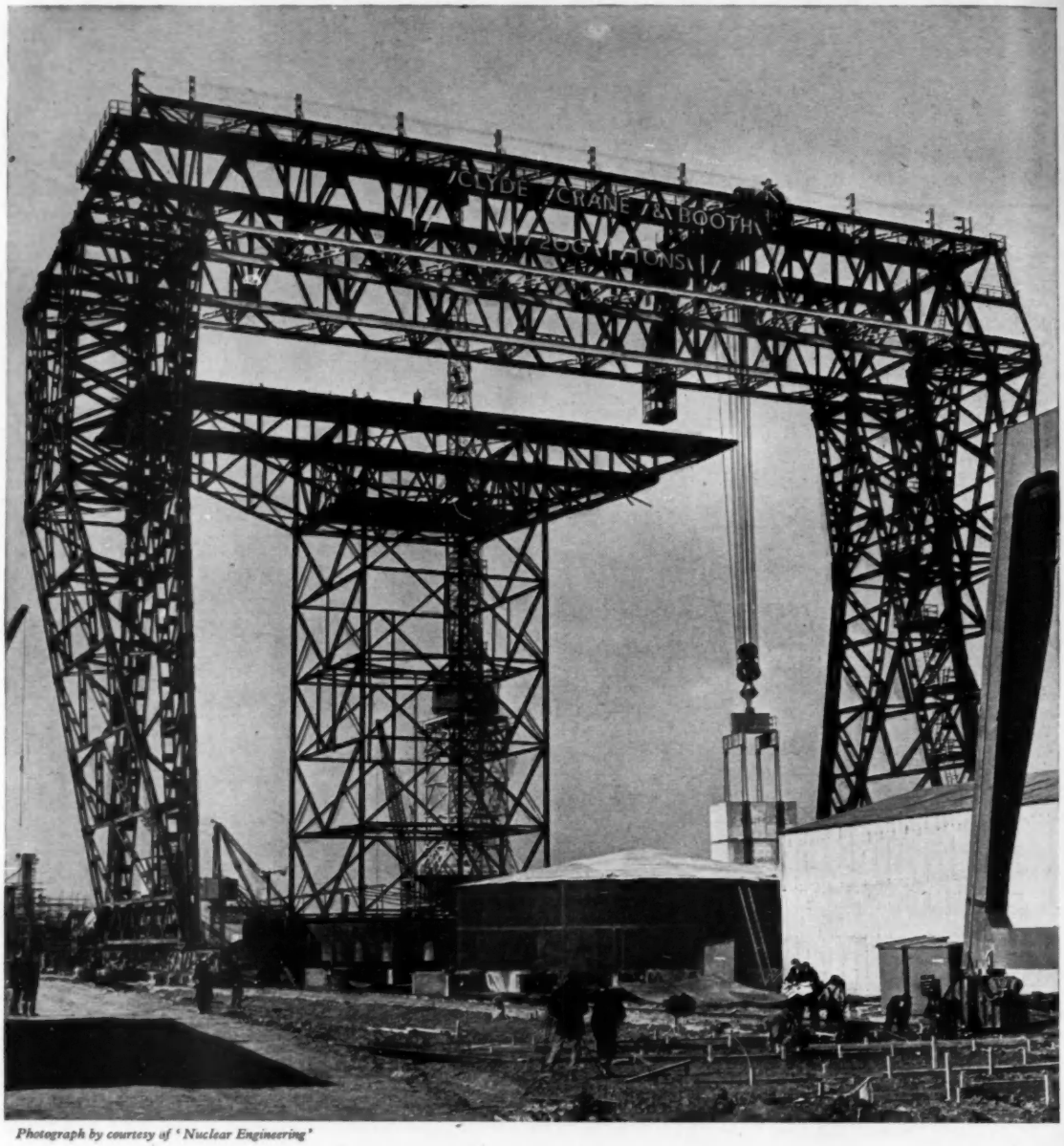

Photograph by courtesy of 'Nuclear Engineering'

Colossus astride Bradwell

THIS GOLIATH heavy-duty crane soars astride the site of the nuclear power station at Bradwell. With a span of 178 ft., a height of 177 ft., and a weight of 800 tons, it is one of the biggest in the world. Lifting 200 tons at a time, and entirely self-contained, this colossus could well save six months in a project vital to Britain's future.

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The story of the colossus at Bradwell shows again that, even in the most specialised sectors of industry, there are Shell oils and greases to meet every lubrication need. If your organisation have any major lubrication problems, it pays to get in touch with your local distributors of Shell Industrial Lubricants.

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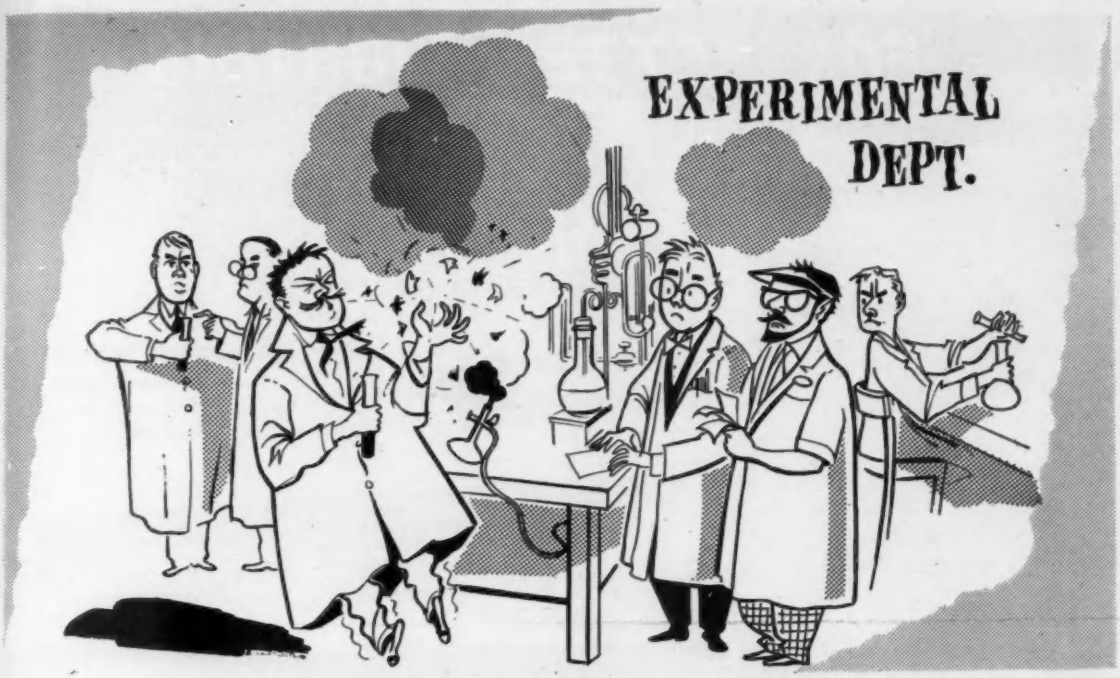

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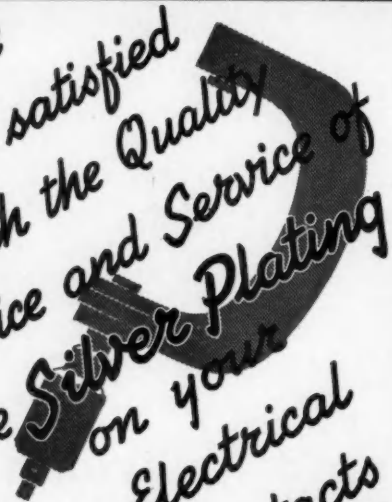

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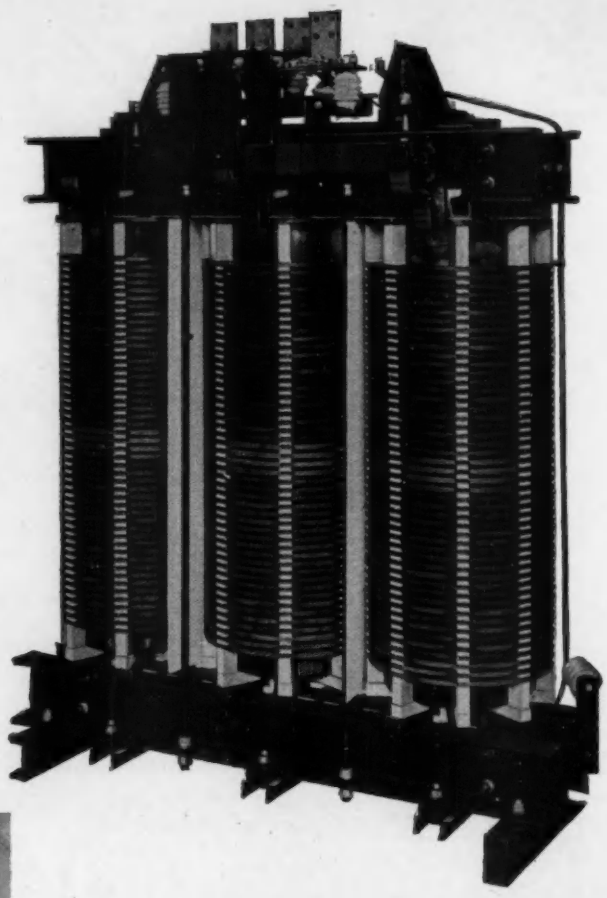

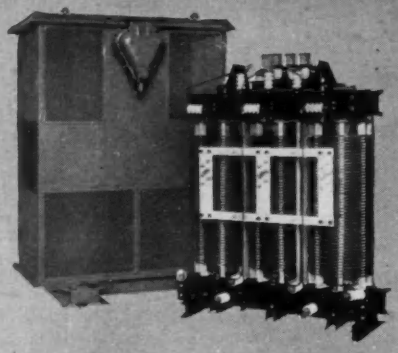

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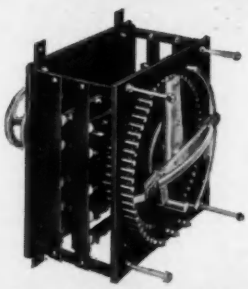

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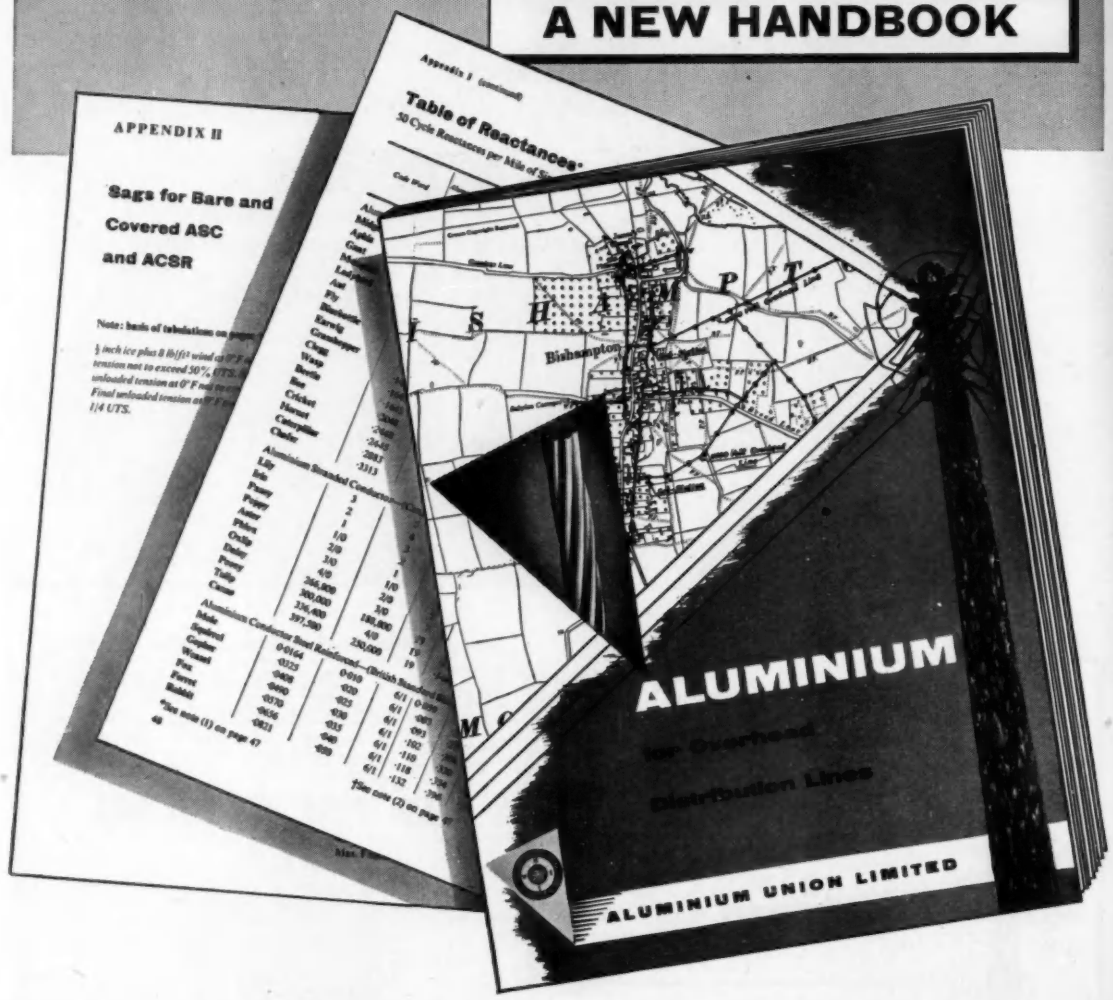

Copies of the book are obtainable free on request from Aluminium Union Limited, or our Associated Company in Great Britain, Northern Aluminium Company Limited, Development Division, Southam Road, Banbury, Oxfordshire.

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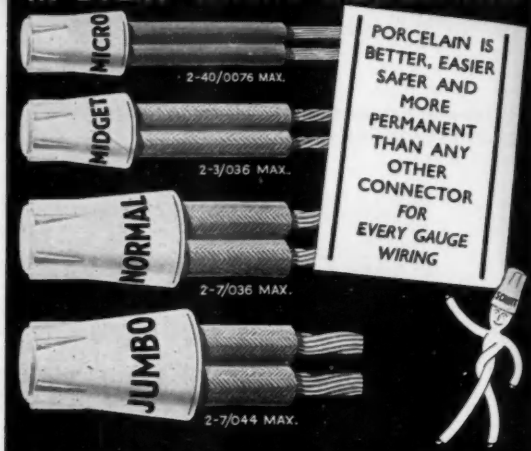

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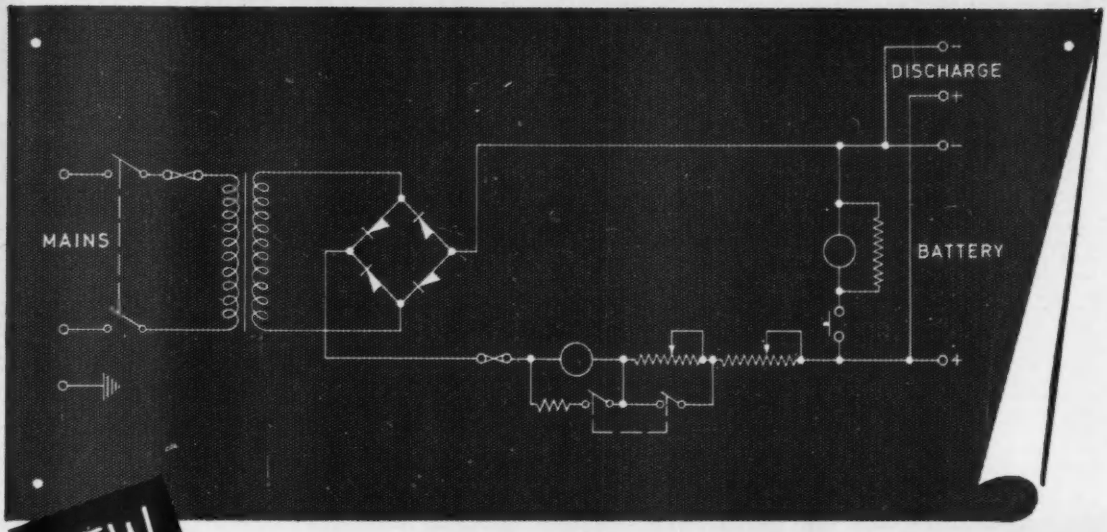

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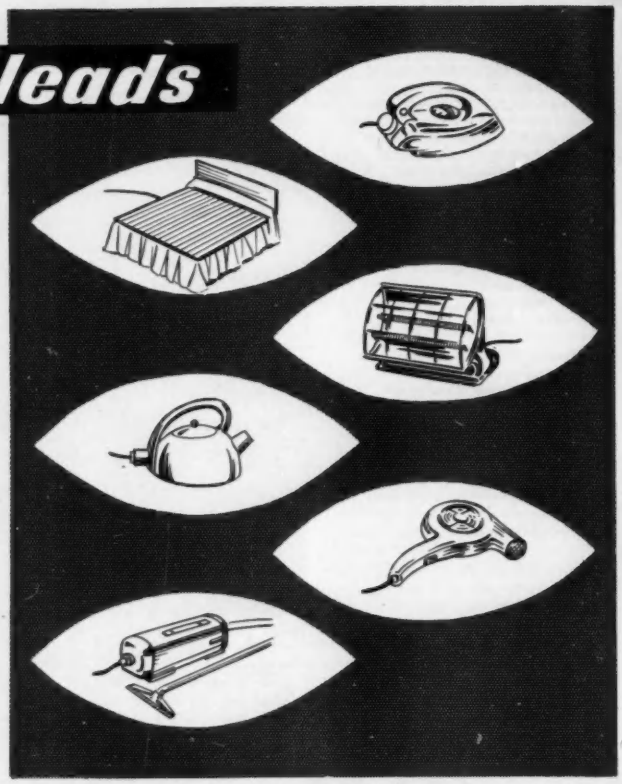

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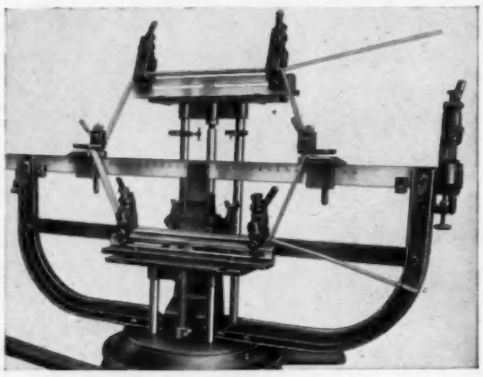

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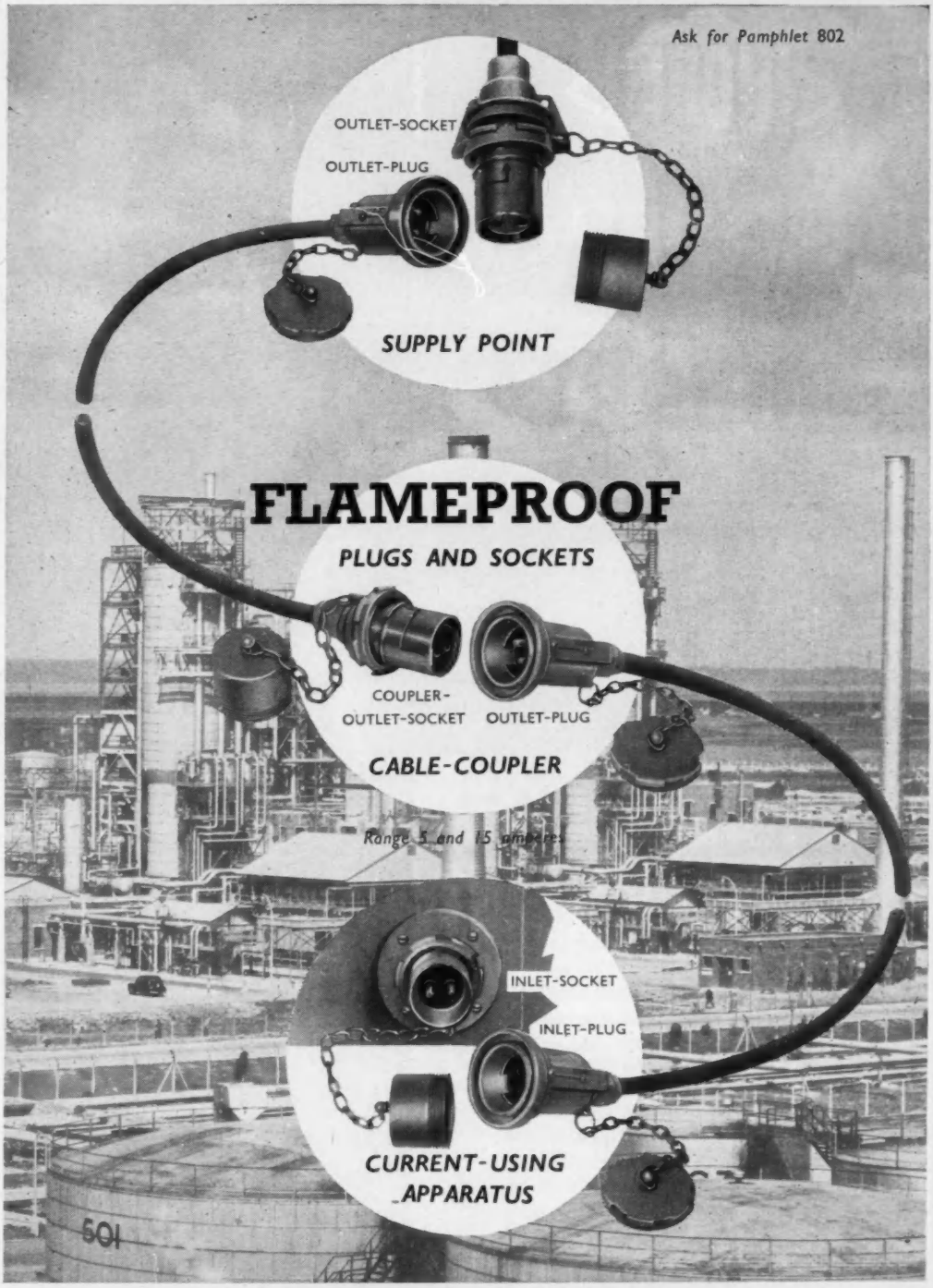

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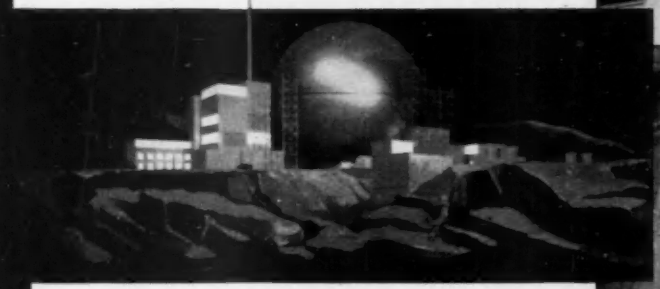

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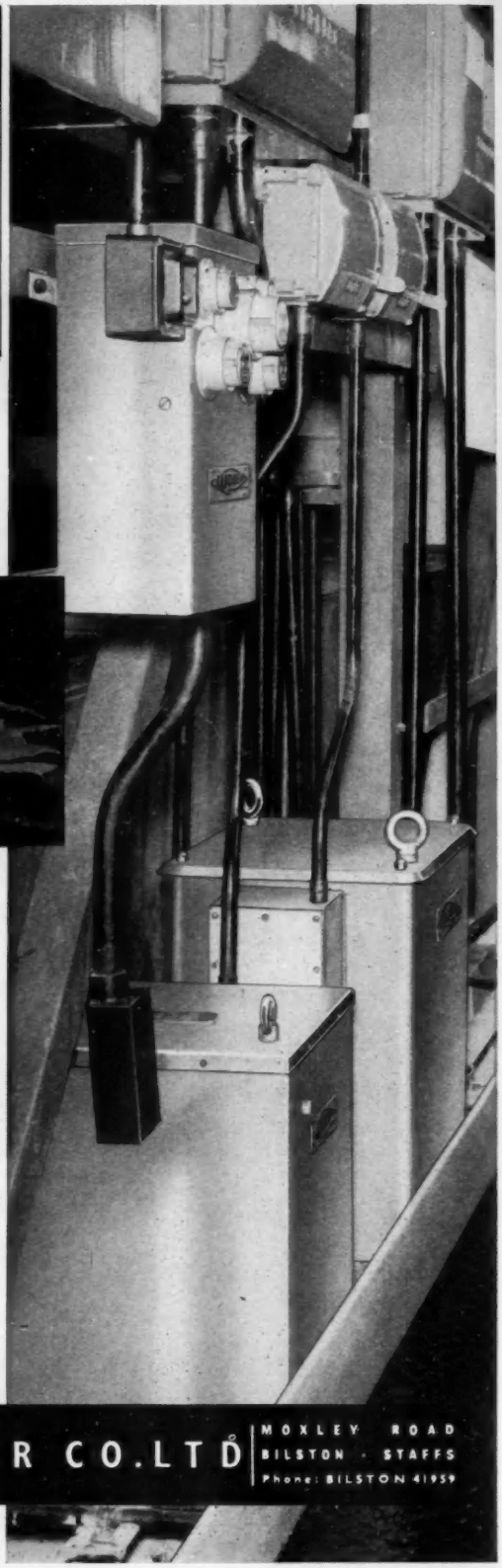

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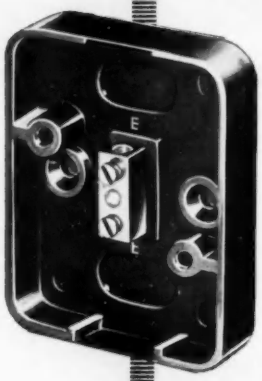

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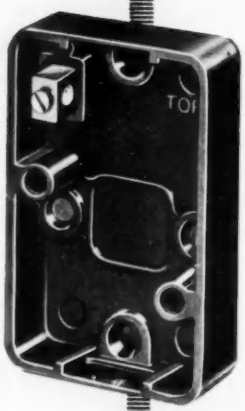

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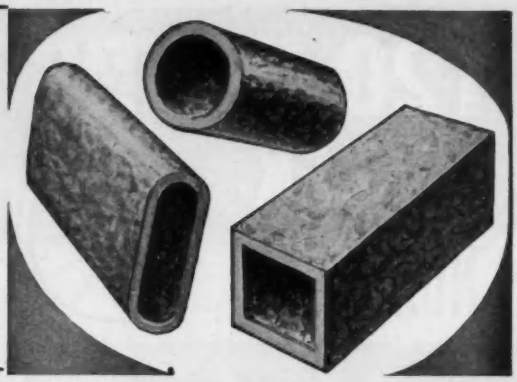

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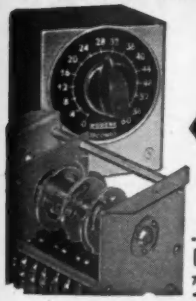

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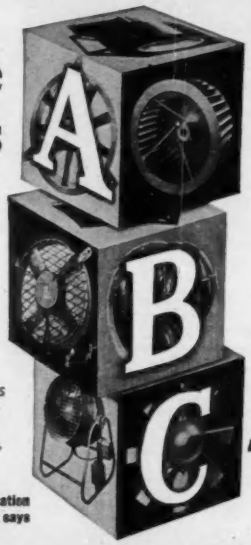

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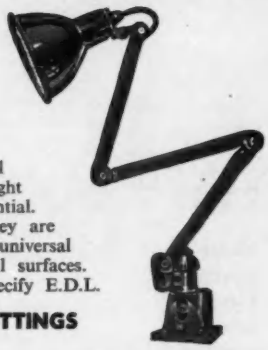

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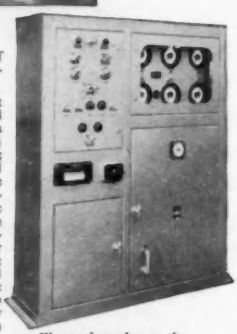

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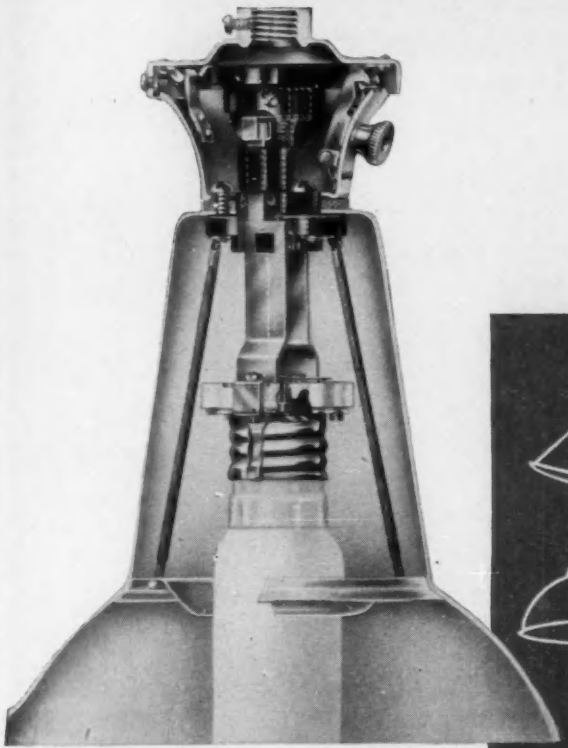

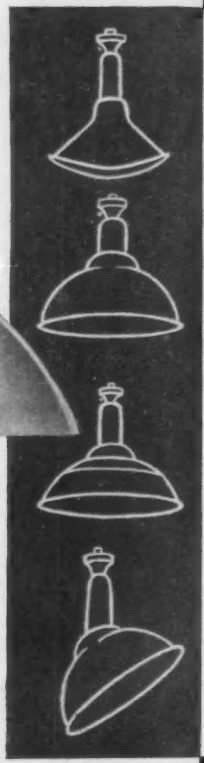

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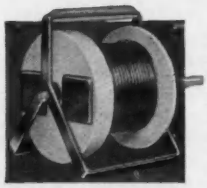

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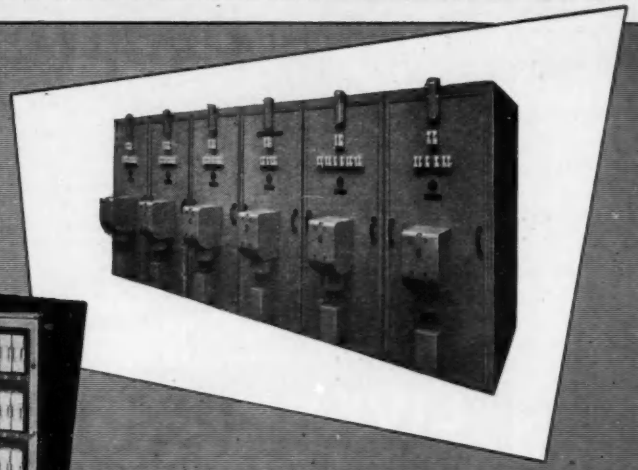

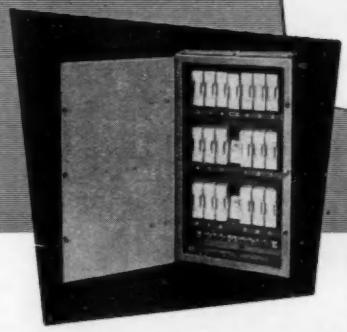

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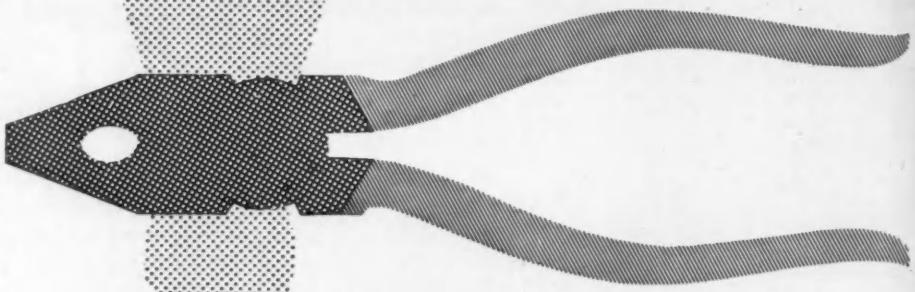

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(Continued from page 101)

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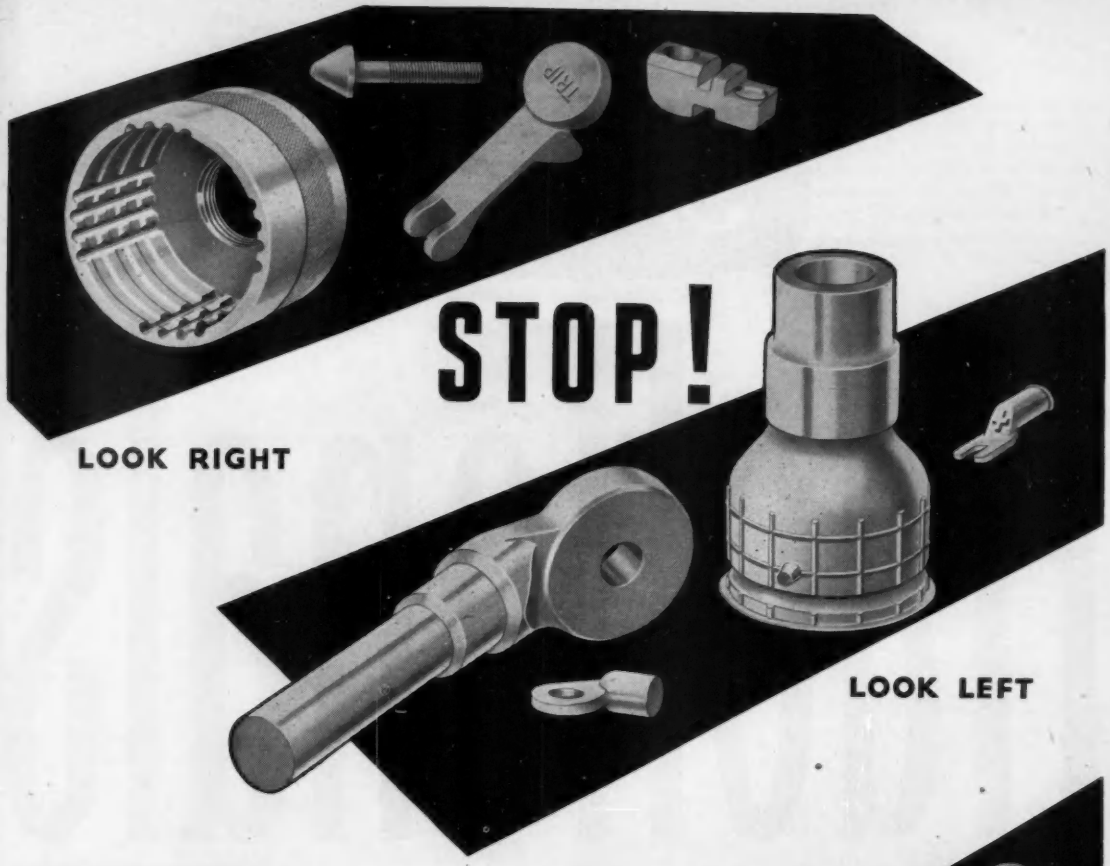

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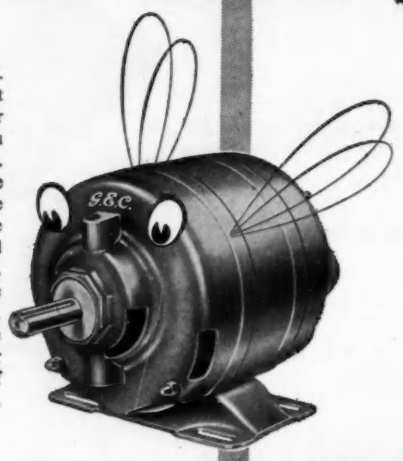
Power for many purposes. Power to drive your own plant efficiently, or to add further distinction to the equipment you make and sell. Power. As much (up to 1 h.p.) or as little as you need, in a wide range of mountings, but always with the reliability for which all G.E.C. engineering is famous. Power, from sturdy, dependable G.E.C. Fractionals. Most sizes and mountings are held in stock—that's another advantage of dealing with the G.E.C.



G.E.C. manufacture many types and sizes of fractional motors for light industrial and domestic drives—whether for your plant or products our engineers will always be pleased to help you choose the right motor for the job.

Fully detailed illustrated publication on application.

The Busy Bee from G.E.C.

THE GENERAL ELECTRIC CO. LTD. MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

Classified Advertisements

CLASSIFIED advertisements are PREPAID at 3/6 per line (approx. 6 words) per insertion. Where an advertisement includes a Box Number there is an additional charge of 1/-.

DISPLAYED CLASSIFIED:—48/- per inch. Cheques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW PUBLICATIONS LTD.

SERIES DISCOUNTS for consecutive insertions:—13, 5%; 26, 10%; 52, 15%.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

REPLIES to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1, but if not to be delivered to any particular firm or individual they should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Replies in such cases cannot be returned. The name of an advertiser using a Box Number will not be disclosed.

ADVERTISEMENTS are accepted up to First Post on Monday of the week of issue and should be addressed to ELECTRICAL REVIEW, Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1.

Original testimonials should not be sent with applications for employment

OFFICIAL NOTICES, TENDERS, ETC.

NEWBURN URBAN DISTRICT COUNCIL

Group "A" Lighting

TENDERS are invited for the supply and erection of a Group "A" Street Lighting installation, 140-watt sodium on concrete columns and street lighting cable, as follows:—

(1) The supply and delivery of electrical equipment.
(2) The supply, delivery and erection of 56 columns, together with the fixing and wiring of electrical equipment.
(2) The supply and laying of street lighting cable.

Forms of tender, specification and bills of quantities may be obtained upon application to the Surveyor, Council Offices, Newburn, Newcastle upon Tyne, 5. Tenders to be returned to the undersigned in the special envelope provided by the Council, endorsed "Group A Lighting," and bearing no indication of the sender, by noon on 28th November, 1958.

The Council does not bind itself to accept the lowest or any tender.

THOS. SHAW,
Clerk of the Council.

Council Offices,
Newburn,
Newcastle upon Tyne, 5.
23rd October, 1958. 5303

SKIPTON URBAN DISTRICT COUNCIL

Trunk Road Lighting

TENDERS are invited for:—

(a) Supply and delivery of 37 sets of lighting equipment for 400-watt colour-corrected mercury vapour fluorescent lighting, consisting of lanterns, lamps, control gear and time switches; and
(b) Supply and delivery of 35 steel columns and arms and 1 wall bracket, together with erection, fitting of equipment and bringing system into service.

Contract drawings may be inspected at the office of the Engineer and Surveyor, Town Hall, Skipton, from whom forms of tender, specification and bills of quantities may be obtained on deposit of £1 1s. (returnable on receipt of bona fide tender). Tenders must be returned to me, in envelope provided, by 17th November, 1958.

The Council do not bind themselves to accept the lowest or any tender, and reserve the right to accept the whole or part only of any tender.

L. E. SMITH,
Clerk to the Council.
5242

COUNTY OF CORNWALL

APPLICATIONS are invited from Electrical Contractors for permission to tender for the ELECTRICAL SERVICES Sub-Contract in connection with the erection of a new COUNTY SECONDARY SCHOOL at ST. AUSTELL.

Applications should be made to Architects' Co-Partnership, 44, Charlotte Street, London, W.1, not later than Wednesday, 5th November, 1958, from which a selected number of firms will be invited to tender.

The closing date for receipt of tenders will be notified when the documents are despatched.

The lowest or any tender will not necessarily be accepted, nor will the County Council pay to contractors any fees or expenses incurred in the preparation of tenders.

E. T. VERGER,
Clerk of the County Council.

County Hall, Truro.
17th October, 1958. 5270

BOROUGH OF HEYWOOD

Electrical Installation: 16 Dwellings

THE Corporation invite tenders for the electrical installation of 16 dwellings at South Street.

Specification and form of tender may be obtained on application to the Borough Engineer and Surveyor, Municipal Buildings, Heywood, enclosing a deposit of £2 2s., which will be returned on receipt of a bona fide tender. Plans and detailed drawings may be inspected at the Borough Surveyor's Department (Architects' Section).

Tenders to be returned not later than 12 noon on Friday, 5th December, 1958, in the envelope provided and endorsed "Electrical Installation, 16 Dwellings," and delivered to W. R. Parker, Town Clerk, Heywood.

The Corporation does not bind itself to accept the lowest or any tender.

W. R. PARKER,
Town Clerk.

Municipal Buildings,
Heywood,
23rd October, 1958. 5302

BOROUGH OF MITCHAM

Street Lighting Improvements, Stage XIV (b)

TENDERS are invited for the erection only of 11 single-arm reinforced concrete columns with 140-watt sodium discharge lamps and lanterns on Class A roads and 68 columns with 100-watt tungsten filament lamps and lanterns on Class B roads, complete with control gear and wiring.

Form of tender, specification and bill of quantities may be obtained from the Borough Engineer and Surveyor, Town Hall, Mitcham, at whose office the drawings and general conditions of contract may be inspected.

Tenders must be delivered to the undersigned, in the envelope provided, not later than 12 noon on Saturday, 8th November, 1958.

The Council do not bind themselves to accept the lowest or any tender.

R. H. WHITE,
Town Clerk.

Town Hall,
Mitcham.
20th October, 1958. 5243

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Central Perthshire Reinforcement

Electric Lighting, Heating and Small Power Services for Braco Substation

TENDERS are invited for the supply and erection of the above-mentioned wiring work. Tender documents may be obtained from the Engineers, Messrs. Kennedy & Donkin, 12, Caxton Street, London, S.W.1, on receipt of £2 2s. deposit (returnable).

The Board do not bind themselves to accept the lowest or any tender. 5304

SITUATIONS VACANT

TRANSFORMER DESIGNERS

A WELL-known transformer firm situated in S.W. London which has recently expanded its manufacturing capacity wishes to augment its design staff. A wide variety of transformer types are at present being produced, and sizes up to 10 MVA capacity will probably be made within the next few years.

There are vacancies for senior and junior designers, and those interested should write with full details of training and experience to—Box 5314.

CENTRAL ELECTRICITY GENERATING BOARD

Eastern Division

APPLICATIONS are invited for the following positions:—

ASSISTANT SHIFT CHARGE ENGINEERS, LITTLE BARFORD "A" & "B" GENERATING STATION
(Staff Vacancy No. 1076).

Salary Class H, Grade 8, £935 × £20 to £995 per annum plus 10% shift allowance, rising shortly to Class J, £995 × £20 to £1,055 per annum.

Applicants should have served an apprenticeship and obtained a Higher National Certificate in Electrical or Mechanical Engineering, or equivalent. Preference will be given to applicants who have had experience in the operation of large modern units utilising pulverised fuel.

THIRD ASSISTANT ENGINEER
(Efficiency and Testing),
GENERATION (Operation) DEPT.,
DIVISIONAL HEADQUARTERS
(Staff Vacancy No. 1077).

Salary Class AX/DX, Grade 6, £895 × £25 to £1,020/£1,110 per annum plus London weighting.

The commencing salary will depend upon the qualifications and experience of the successful applicant. Applicants should possess good technical qualifications with particular reference to thermo-dynamics, and have had experience in a modern generating station. Practical experience of plant testing and instrumentation would be an advantage.

Duties will involve testing of new and existing plant in Divisional generating stations and investigations of a varied and interesting character, and the appointment carries good prospects of promotion.

Applications, quoting Reference No. 9834 and appropriate staff vacancy number, stating age and experience, should be sent to the Controller, Central Electricity Generating Board, Eastern Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts, by 8th November, 1958.

W. N. C. CLINCH,
Controller. 5292

JOSEPH LUCAS

(ELECTRICAL) LIMITED

Great King Street, Birmingham, 19

ENGINEER

EXPANSION of development of ignition equipment for gas turbines and allied projects creates a vacancy for a practical engineer with experience of design for economic production of electrical apparatus. The work is of a high technical standard and applicants should preferably possess an honours degree.

The post is permanent and pensionable and offers considerable scope for advancement to a progressive engineer.

Apply in writing stating age, qualifications and experience to the Personnel Manager, Joseph Lucas (Electrical) Ltd., Great King Street, Birmingham, 19, quoting reference PM/D/190.

128

Situations Vacant (continued)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Northern Area

A. Senior Assistant Engineer (Planning and Protection)
B. Senior Assistant Engineer (Operation and Maintenance)
C. Second Assistant Engineer (Operation and Maintenance)
D. Senior Draughtsman

APPLICATIONS are invited for the above appointments in the Area Engineering Department located at Dingwall, Ross-shire.

The successful candidates will be required to contribute to the Board's superannuation scheme and may be required to undergo a medical examination.

A. SENIOR ASSISTANT ENGINEER (Planning and Protection), one vacancy. Salary N.J.B. Class G, Grade 3, £1,235 × £30 to £1,325. Candidates must have considerable experience in the planning and layout of H.V. and L.V. distribution networks and associated protection. Experience of load flow study and fault power calculation essential. Minimum qualification: Corporate Member of the Institution of Electrical Engineers or equivalent.

B. SENIOR ASSISTANT ENGINEER (Operation and Maintenance), one vacancy. Salary N.J.B. Class G, Grade 3, £1,235 × £30 to £1,325. The successful candidate, who must have extensive experience, will be required to take charge of the operation of extensive distribution networks, mainly of a rural character, and be responsible for the maintenance of transmission and distribution lines and substations in voltages up to 132 kV. Minimum qualification: Corporate Member of the Institution of Electrical Engineers or equivalent.

C. SECOND ASSISTANT ENGINEER (Operation and Maintenance), one vacancy. Salary N.J.B. Class G, Grade 6, £995 × £20 to £1,055. The successful candidate will be required to assist the Senior Assistant Engineer (Operation and Maintenance) in the operation of urban and rural systems extending over 8,600 square miles of territory and with 4,400 miles of line in service. Considerable experience in the maintenance of transmission and distribution lines and substations essential. Minimum qualification: Higher National Certificate.

D. SENIOR DRAUGHTSMAN, one vacancy. Salary N.J.B. Schedule D, Grade 5, £760 × £20 to £860. Candidates should have considerable experience in the electricity supply industry and be capable of designing distribution substations. The successful candidate will be required to take charge of a section dealing with mains records, and preferably should have some experience in surveying and profiling for overhead transmission lines.

Application forms obtainable from W. S. FOWLIE, M.I.E.E., AREA MANAGER, NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD, CHURCH STREET, DINGWALL, which should be returned not later than 17th NOVEMBER, 1958. 5276

BUCKINGHAMSHIRE EDUCATION COMMITTEE

HIGH WYCOMBE COLLEGE OF FURTHER EDUCATION

(Principal: W. J. Davies, J.P., B.Sc.)

REQUIRED to take up duty not later than 1st January, 1959, GRADE B ASSISTANT to teach Electrical Engineering subjects to H.N.C. and C. and G. students. Candidates, who should be graduates in electrical engineering with good industrial and/or teaching experience, should be capable of teaching some H.N.C. subject.

Salary will be paid in accordance with the appropriate Burnham Report, i.e., £650 × £25 to £1,025 per annum plus additions for training and qualifications where appropriate and increments on the scale for previous approved experience.

Forms of application may be obtained from the Principal at Queen Alexandra Road, High Wycombe, to whom they should be returned as soon as possible. 5271

CENTRAL ELECTRICITY BOARD OF THE FEDERATION OF MALAYA

APPLICATIONS are invited from suitably qualified FEDERAL CITIZENS OF THE FEDERATION OF MALAYA for the following posts :—

DIVISION I: ELECTRICAL ENGINEERS (M2C/50326/EF).

Monthly salary scales: —

Time Scale "B."
Between $740 and $950 for a single man.
Between $870 and $1,140 for a married man.
Between $870 and $1,195 for a married man with family.

Time Scale "A."
Between $1,000 and $1,254 for a single man.
Between $1,190 and £1,430 for a married man.
Between $1,265 and $1,505 for a married man with family.

Candidates, who must be at least 24 and below 40 years of age, must have had a good general education and be Corporate Members or Graduates of the Institution of Electrical Engineers or possess degrees or other educational qualifications carrying exemption from the Institution Graduateship Examinations. They should have had sound training in both electrical and mechanical engineering and experience in the operation of electricity supply undertakings. They should possess a competent knowledge of the erection and maintenance of high and low-tension overhead and underground A.C. distribution systems and substation plant. Experience in the operation and maintenance of diesel engines an advantage.

DIVISION I: PUPIL ENGINEERS (Electrical) (M2C/50331/EF).

Monthly salary:—
1st year ... Single $620; married $676
2nd year ... Single $650; married $726

Candidates, who must be at least 21 and under 28 years of age, must have had a good general education and be Graduates of the Institution of Electrical Engineers or possess degrees or other educational qualifications carrying exemption from the Institution Graduateship Examinations. A period of pupilage with a recognised electrical or mechanical undertaking would be an advantage, but it may be necessary for the successful candidates to undergo a further period of pupilage either in Malaya or abroad.

Successful candidates for the above posts will be required to undergo a medical examination prior to taking up appointment and satisfactory proof of physical fitness will be required before an appointment can be offered. Quarters are not normally available but an appropriate housing allowance will be paid in lieu. Medical attention is provided for employees, their wives and children. Free passages to Malaya will be provided for an officer, his wife and up to three children under the age of 16.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote reference number shown against post applied for. 5245

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable appointment in the Technical Section of the Chief Engineer's Department at Board Headquarters, Glasgow :—

THIRD ASSISTANT ENGINEER
(Protective Gear).

Candidates should possess a Degree or Higher National Certificate in Electrical Engineering, and should preferably have experience in commissioning high-voltage electrical apparatus and routine maintenance and testing of protective gear. Previous experience at the works of a manufacturer of the above equipment will also be an advantage. The scope of the work embraces equipment in the Board's generating stations and transmission system.

Salary £895/£1,140 per annum in accordance with Class AX/EX, Grade 6 of Schedule B to the National Joint Board Agreement.

Apply, quoting Reference No. E43/58, on standard form AE.6, available from the Secretary, P.O. Box 173, 351, Sauchiehall Street, Glasgow, C.2, not later than Monday, 10th November, 1958. 5277

CENTRAL ELECTRICITY GENERATING BOARD

London Division

APPLICATIONS invited for following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London allowance. Qualifications entitling to Graduate Membership of I.E.E. or I.Mech.E. for posts (a) and Corporate Membership for post (b) an advantage.

(a) ASSISTANT MAINTENANCE ENGINEER (Electrical), ACTON LANE POWER STATION (Vacancy No. 58/868).

Successful applicant will be assistant to Electrical Maintenance Engineer. He will also be engaged on testing of protective gear associated with H.T. and L.T. power equipment including primary and secondary injection of C.T. and relay circuits, fault location on cables and control gear. Some knowledge of electronic equipment and commissioning of new plant an advantage. Salary Class J, Grade 9 = £985 p.a.

(b) SHIFT CHARGE ENGINEER, BARKING "C" POWER STATION (Vacancy No. 58/869).

Experienced in operation of modern power plant, with character and ability to supervise staff. Oil firing experience an advantage. Salary Class J, Grade 6 = £1,210 plus £116 shift per annum.

(a) ASSISTANT ENGINEER (Electrical Test), BATTERSEA POWER STATION (Vacancy No. 58/870).

Applicants will be on electrical maintenance staff and engaged on testing of protective gear associated with H.T. and L.T. power equipment including primary and secondary injection of C.T. and relay circuits, fault location on cables and control gear. Some knowledge of electronic equipment and commissioning of new plant will be considered an advantage. Salary Class L, Grade 13 = £885 plus £83 10s. shift p.a.

(a) SHIFT CHARGE ENGINEER, DEPTFORD WEST POWER STATION (Vacancy No. 58/871).

Good technical training and wide experience of power station plant operation, together with character and ability to supervise staff. Salary Class J, Grade 7 = £1,115 plus £106 10s. shift p.a.

(a) ASSISTANT SHIFT CHARGE ENGINEER, WOOLWICH POWER STATION (Vacancy No. 58/872).

Sound engineering and technical training, with modern high-pressure plant operating experience. Salary Class H, Grade 9 = £935 plus £88 10s. shift p.a.

Applications, quoting vacancy number, to (or on form from) Central Electricity Generating Board, London Division, P.O. Box 136, London, W.1, by 10th November, 1958. 5724

A Company of

THE EXPERT TOOL GROUP

requires

SENIOR DESIGNER-DRAUGHTSMEN

Applicants must have had experience in the design of contactors and relays allied to the

MOTOR CONTROL GEAR FIELD.

They should have received an engineering training and be in possession of H.N.C. or equivalent qualification.

The positions are permanent and salary will be paid commensurate with qualifications and experience.

Please write giving age, present salary and full details to :—

Chief Draughtsman
SHARP CONTROL GEAR LTD.
Lount Works
Ashby-de-la-Zouch, Leicestershire

5033

NOTTINGHAM AND DISTRICT TECHNICAL COLLEGE

Burton Street, Nottingham

Principal: D. A. R. Clark, M.Sc.(Tech.), M.I.Mech.E.

APPLICATIONS are invited for the posts listed below, the successful applicants to commence duty as soon as possible.

The College is, in the main, concentrating on advanced work and on account of its substantial new building, which came into full operation in September, 1958, ideal conditions for the development of such work are given. There is a fairly large volume of research work being done in most departments and staff are encouraged to undertake such work either for publications or higher degrees. Staff are allowed to undertake consultancy work for industry.

Department of Electrical Engineering

1. SENIOR LECTURER IN ELECTRICITY SUPPLY.
2. SENIOR LECTURER IN ELECTRONICS, preferably with specialist knowledge on digital computers or semiconductor devices.
3. LECTURER IN TELECOMMUNICATIONS to specialise in Telephony and Line Transmission.
4. ASSISTANT GRADE B for RADIO AND TELEVISION SERVICING in City & Guilds Courses 53 & 54. A good theoretical background is necessary and practical servicing experience is essential.

In the case of posts 1, 2 and 3 above, an Engineering Degree or Associate Membership of the appropriate institution is essential.

IT IS ESSENTIAL FOR CANDIDATES APPLYING FOR ALL OF THE ABOVE POSTS TO HAVE UP-TO-DATE INDUSTRIAL EXPERIENCE.

Salaries in accordance with the Burnham Technical scale as follows:—Senior Lecturer: £1,350 rising by annual increments of £50 to £1,550 per annum. A salary above the minimum will be paid in approved cases. Lecturer: £1,200 rising by annual increments of £30 to £1,350 per annum. A salary above the minimum will be paid in approved cases. Assistant Grade B: £650 × £25 to £1,025 per annum. Additions for assistants include degree allowance of £75 per annum (or £125 for good honours degree), up to 3 increments of £25 for training in approved cases and incremental allowance for industrial experience after age 21, and war service.

Further particulars and form of application may be obtained from the Principal, to whom completed forms should be returned not later than 14th November, 1958. 5322

SOUTH OF SCOTLAND ELECTRICITY BOARD

Glasgow Area

Fourth Assistant Engineer, Planning and Development

APPLICATIONS are invited to fill the above post in the Area. Applicants should have a sound engineering training. The work will involve the design and layout of distribution networks at pressures up to and including 33 kV in a densely loaded area. Knowledge of the application of modern protective equipment and of the calculation of fault levels and preparation of load flow diagrams would be an advantage.

The possession of the Higher National Certificate or equivalent qualification is desirable.

Salary scale £835/£880 per annum, Class L, Grade 13.

The conditions of employment will be in accordance with the National Joint Board Agreement for the Electricity Supply Industry. The position is superannuable.

The successful candidate will require to reside within reasonable distance of Area Headquarters.

Applications on the standard form, which may be obtained from the undersigned, should be completed and returned not later than fourteen days from the appearance of this notice.

A. KELSO,
Manager.

P.O. Box 6,
75, Waterloo Street,
Glasgow, C.2.
20th October, 1958. 5279

COUNTY BOROUGH OF WARRINGTON

Borough Engineer and Surveyor's Department

APPLICATIONS are invited for the following permanent appointment :—
ENGINEERING ASSISTANT (Lighting):
Within Special Grade
(£750 to £1,030 per annum).

The appointment, which is terminable by one month's notice on either side, is subject to the conditions of service of the National Joint Council for Local Authorities Administrative, Professional, Technical and Clerical Services and the provisions of the Local Government Officers' Superannuation Act, 1937, the successful candidate (if a new entrant to the Council's service) being required to pass a medical examination.

Candidates should state the qualifications they hold.

The candidate appointed will be responsible to the Borough Engineer for the control of a small gas lighting department, the supervision of electrical lighting carried out by the agency of an Electricity Board, the preparation of new lighting schemes, and other general electrical work.

Housing accommodation will be made available if required.

The canvassing of members of the Council, either directly or indirectly, will be a disqualification, and applicants must state whether to their knowledge they are related to any member of the Council, or any co-opted member of a committee, or any officer of the Council. Failure to do so will disqualify or may lead to dismissal without notice.

No printed form of application is being used. Applications stating age, details of training and experience, qualifications, present and previous appointments (in chronological order), together with copies of three recent testimonials, or the names of three referees, should be forwarded to the undersigned so as to be received not later than 12 o'clock noon on Monday, the 10th November, 1958.

J. Y. HUGHES, M.I.C.E.,
Borough Engineer and Surveyor.

Town Hall,
Warrington. 5182

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Aberdeen Area

APPLICATIONS are invited from suitably qualified persons for the following superannuable positions and should be made before 12th November, 1958, to the undersigned on a form which will be supplied on request.

1. SECOND ASSISTANT ENGINEER (Maintenance). N.J.B. Grade G.6 (£995 × £20 to £1,055). Experience in maintenance of overhead, underground, and substation equipment for 33 & 11-kV systems. Experience of 132-kV line maintenance would be an advantage.

2. FIRST ASSISTANT DISTRICT ENGINEER (No. 3 District). N.J.B. Grade F.5 (£995 × £20 to £1,055). Experience in the operation of plant in an urban district at system voltages of up to 33 kV, and of planning and construction up to 11 kV is essential.

3. SECOND ASSISTANT ENGINEER (Construction). N.J.B. Grade G.7 (£935 × £20 to £995). Experience in construction of overhead and underground circuits and substation equipment for system up to 33 kV is necessary.

4. THIRD ASSISTANT ENGINEER (Planning). N.J.B. Grade G.9 (£835 × £15 to £880). Experience in design and planning of overhead and underground systems at voltages up to 11 kV is essential. 33 kV planning experience would be an advantage.

5. THIRD ASSISTANT ENGINEER (Construction). N.J.B. Grade G.10 (£790 × £15 to £835). Constructional experience in the same field as that of the last appointment is necessary.

6. GENERAL ASSISTANT ENGINEER (Technical). N.J.B. Grade G.14/13 (£590 × £15 to £680). Experience in electrical measurements and meter testing is necessary, but a knowledge of automatic protective and/or light current equipment would be an advantage.

7. GENERAL ASSISTANT DISTRICT ENGINEER (No. 1 District). N.J.B. Grade D.10 (£635 × £15 to £680). Some experience of operation of equipment up to 11,000 volts in an extensive rural district would be an advantage.

J. E. WHITTAKER,
Area Manager.

Millburn Street,
Aberdeen 5309

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Dundee Area

APPLICATIONS are invited from suitably qualified engineers for the following appointments :—

SECOND ASSISTANT ENGINEER
(Construction).

Applicants should be experienced in the survey, design and erection of overhead lines up to 33 kV and outdoor substations. Duties will include maintenance of 132-kV overhead lines and previous experience will be an advantage. Duties may also include supervision of overhead line contracts.

The salary will be in accordance with the N.J.B. Agreement, Class H, Grade 6 (£1,065-£1,140 per annum).

SECOND ASSISTANT ENGINEER
(Planning).

Applicants should be experienced in city and rural distribution work up to 33 kV. Duties will include the planning of H.V. and L.V. reinforcements, new housing schemes, and city and rural development schemes, the design of indoor and outdoor substations, and assisting with system design up to 33 kV.

The salary will be in accordance with the N.J.B. Agreement, Class H, Grade 6 (£1,065-£1,140 per annum).

FIRST ASSISTANT
DISTRICT ENGINEERS.

There are two vacancies for applicants who have had sound experience in all branches of distribution work, including operation, maintenance and construction of H.V. and L.V. city distribution underground networks and substations. Some experience in 132-kV operation would be an advantage.

Salaries would be in accordance with the N.J.B. Agreement, Class F, Grade 5 (£995-£1,055 per annum).

Applications should be made on forms obtainable from the Area Manager, 7, Dudhope Crescent Road, Dundee, Angus, and must be returned by the 17th November, 1958. 5295

PRODUCTION AND WORKS MANAGER

(Electrical Insulating Materials)

A well-known and expanding organisation is seeking the services of a PRODUCTION AND WORKS MANAGER with prospects of promotion to the Board. Applicants must have a sound engineering background with experience of the manufacture of insulating materials particularly Mica products, coatings, laminates, and be able to deal with plant development and adaptation. A sound commercial approach and ability to discuss problems with the technical director is desired.

Salary £1,500 and upwards according to qualifications and experience. Generous superannuation scheme. Age limit lower 30's to 45.

Applications with full particulars, which will be treated in confidence to:—

WRIGHT ATKINSON LIMITED
Employment Consultants
70 Queen Victoria Street
London, E.C.4

5313

SOUTH EASTERN ELECTRICITY BOARD

CARTOGRAPHIC DRAUGHTSMAN, East Sussex and South West Kent Headquarters.

Salary £640 × £20 to £700 p.a. under N.J.C. Grade 2. Superannuable. Applicants should have had experience in the preparation of mains records, schematic diagrams, wiring diagrams and general drawing office routine.

Applications, quoting reference TER and naming 2 referees, to East Sussex and South West Kent Manager, SEEBOARD, Westlords, Willingdon Road, Eastbourne, by 12th November, 1958.

G. WRAY,
Secretary.

5307

Situations Vacant (continued)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

North Caledonia Area

APPLICATIONS are invited for the following superannuable posts at the Area Office, Elgin, Morayshire. Elgin is situated four miles from the sea and enjoys a mild, healthy climate.

SENIOR ASSISTANT ENGINEER (Construction).

The successful candidate will be responsible to the area engineer for construction of 33 kV and lower voltage substations, overhead lines and cable networks by direct and contract labour. Some experience of 132 kV line construction would be an advantage.

Qualifications preferably Graduate I.E.E., or equivalent.

Salary and conditions of service in accordance with N.J.B. G.4, £1,160/£1,235 per annum.

SECOND ASSISTANT ENGINEER (Construction).

The successful candidate will be required to assist in the construction of 33 kV and lower voltage substations, overhead lines and cable networks.

Qualifications preferably Higher National Certificate in Electrical Engineering.

Salary and conditions of service in accordance with N.J.B. G7, £935/£995 per annum.

CHIEF DRAUGHTSMAN.

The successful candidate would be responsible for the preparation of designs for high voltage indoor and outdoor substations. He would also take charge of the drawing office. A Higher National Certificate would be an advantage.

Salary and conditions of service in accordance with N.J.B. Schedule D4, £895/£995 per annum.

Applications to be made on forms obtainable from and to be returned to the undernoted not later than 12th November, 1958.

A. MENZIES,
Area Manager.

West Villa,
Elgin. 5311

ENGLISH ELECTRIC, RUGBY

Due to continued expansion

ENGINEERS

are required for the

STEAM TURBINE SALES DEPARTMENT

at Rugby.

Applicants should be between 25 and 35 years of age and be of H.N.C. or Degree standard. Previous steam turbine experience is desirable, but extensive knowledge of heavy plant engineering could be considered as an alternative.

These appointments are permanent, offer good salaries, and housing assistance will be given.

Write giving full details to:—

Dept. C.P.S.

336/7, Strand, London, W.C.2

quoting reference ER.1197C.

5281

YORKSHIRE SWITCHGEAR AND ENGINEERING CO. LTD.

Leeds, 6

invites applications for the following posts:—

SALES ESTIMATING AND CONTRACTS ENGINEERS.

Minimum qualifications O.N.C. in Electrical Engineering, but individual consideration would be given to non-qualified but experienced applicants.

Applications, which will be guaranteed strict confidence, must state age, experience and salary required. 5259

CENTRAL ELECTRICITY GENERATING BOARD

South Western Division

APPLICATIONS are invited for the following vacancies in the Transmission Department at Divisional Headquarters, Bristol.

Vacancy No. 413/58. FOURTH ASSISTANT ENGINEER, Maintenance Section.

Applicants should possess qualifications leading to Corporate Membership of I.E.E., experience in the maintenance or construction of overhead lines and/or substations would be considered an advantage.

Vacancy No. 414/58. FOURTH ASSISTANT ENGINEER, Construction Section.

Duties are in relation to the planning and construction of high voltage overhead transmission lines and the supervision of contracts. Technical education to Higher National Certificate is desirable.

Vacancy No. 415/58. FOURTH ASSISTANT ENGINEER, Construction Section.

The successful candidate will assist in the supervision of contracts in connection with new grid substations and extensions to existing substations. Duties will include co-ordination of technical and engineering features and programming of contracts. Higher National Certificate or equivalent is desirable.

Vacancy No. 413, Grade 8AX/DX, £710-£910 per annum. Vacancy No. 414, Grade 7AX/DX, £710-£910 per annum. Vacancy No. 415, Grade 8AX/DX, £810-£1,010 per annum according to qualifications and experience.

Applications on Form A.E.6/ACT, obtainable from the Divisional Secretary, 26, Oakfield Road, Bristol, 8, should be completed and returned by 12th November, 1958. Please quote vacancy number. 5316

ENGLISH ELECTRIC VALVE COMPANY

Chelmsford, Essex

require experienced

ENGINEERS

for their Semi-conductor Department.

(1) An engineer to take charge of a section dealing with the assessment and application of semi-conductor power rectifiers.

Qualifications for this post are a University Degree in Electrical Engineering or Corporate Membership of the I.E.E., and a minimum of two years' experience of semi-conductors and associated circuit knowledge.

(2) An engineer for further development of semi-conductor rectifiers.

Qualifications for this post are a Physics Degree and some experience of semi-conductor power rectifier design.

Applicants for the above positions should write with brief details of their experience to—

Dept. C.P.S.
Marconi House, Strand, London, W.C.2
quoting Ref. ER.1502D.

5255

MECHANICAL AND ELECTRICAL ENGINEERS

PENSIONABLE posts for men and women normally under 35 on 1st September, 1958. Applicants must normally have degree in engineering or physics (or Dip. Tech. for some posts) or have passed examinations necessary for A.M.I.Mech.E., A.M.I.E.E., A.F.R.Ae.Soc., etc. Exceptionally, evidence of high professional attainment acceptable in lieu. Practical training and experience required, but graduates without practical experience acceptable for some posts.

Men's starting salary from £755 (lower if under 25) to £1,085. Maximum (London) £1,250. Promotion prospects.

Write Civil Service Commission, 30, Old Burlington Street, London, W.1, for application form, quoting S851/58. Closing date 18th November, 1958. Earlier applicants may be interviewed before that date. 5171

CENTRAL ELECTRICITY GENERATING BOARD

Southern Division

STATION CHEMIST, POOLE GENERATING STATION (S/13.1034).

Applicants should be fully qualified industrial chemists and have had practical experience of fuel, oil and water testing and boiler chemistry associated with high temperatures and pressures.

The successful applicant will be required to control ion-exchange plant and to deal with fouling problems arising from (a) oil-firing and (b) marine life in culverts.

Salary N.J.B. K/6, £1,235-£1,325.

GRADE 10 ENGINEERS, POOLE GENERATING STATION (S/13.1035).

The person appointed will be given an opportunity to gain experience on oil-fired plant operation, control room duties and maintenance work. Operating experience of modern generating station plant is essential.

Preference will be given to those possessing qualifications leading to corporate membership of a recognised professional institution or equivalent qualifications.

Salary N.J.B. K/10, £935-£995 plus 10% allowance when on shift.

Special application forms, obtainable only from P. D. A. Oliver, Divisional Secretary, Central Electricity House, High St., Portsmouth, should be returned by the 12th November, 1958. 5320

ROYAL NAVAL SCIENTIFIC SERVICE

SENIOR SCIENTIFIC OFFICERS and SCIENTIFIC OFFICERS required for establishments in London area, Baldock, Portsmouth, Portland, Poole, Greenock and Rosyth. Main requirements are about 25 vacancies for PHYSICISTS, ELECTRONIC ENGINEERS and MATHEMATICIANS in areas specified.

The following particular vacancies also exist: MECHANICAL ENGINEER for work on gas turbine problems in the London area. MECHANICAL ENGINEER for work on design and development of U/W devices in Portland area. METALLURGISTS for Rosyth and Poole. CHEMISTS (Physical and Inorganic) for Poole area, Baldock and London.

Candidates must normally be natural-born British subjects of natural-born British parents, with at least First or Second Class Honours degrees or equivalent high professional attainments. S.S.O.s must have had at least three years' postgraduate experience and be not less than 26 years of age.

Salaries (men): S.S.O. £1,190-£1,410; S.O. £635-£1,110 (London); somewhat lower in Provinces. Appointments unestablished (with F.S.S.U. benefits), but opportunities may occur for those between ages of 21 and 32 to compete for established posts.

Forms from M.L.N.S., Technical and Scientific Register (K), 26, King Street, London, S.W.1, quoting A98/8A. 5164

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern Division

Steam Testing Department

APPLICATIONS are invited for the appointment of a SECOND ASSISTANT ENGINEER in the Steam Testing Department with headquarters at Dunston, to control a small section investigating the thermal performance and operating characteristics of a wide variety of modern steam plant. The work demands considerable initiative and offers experience of testing techniques in an interesting field.

Applicants should be Corporate Members of the Institutions of Mechanical or Electrical Engineers, and should have previous plant testing experience. A knowledge of power station operation will be considered an advantage.

The salary for the appointment will be in accordance with the National Joint Board Agreement, Schedule B, Grade 4 (£1,145-£1,375) and will commence at a point commensurate with qualifications and experience.

Forms of application may be obtained from Divisional Establishments Officer, Central Electricity Generating Board, North Eastern Division, Carliol House, Newcastle upon Tyne, 1, to whom they should be returned to arrive not later than 30th November, 1958. 5293

YORKSHIRE ELECTRICITY BOARD

No. 3 (Sheffield) Sub-Area

TEMPORARY CLERK OF WORKS
(Rotherham).

A Clerk of Works is required to supervise the construction of office, workshop and garage buildings on a site in Rotherham. The work is now commencing and is expected to last for three years.

Applicants should have a thorough knowledge of building construction, with a wide experience of all classes of cast in-situ concrete work.

Preference will be given to candidates who are Members of the Institute of Clerks of Works.

Salary £930 per annum.

TEMPORARY CLERK OF WORKS
(Sheffield).

Applicants should have a thorough knowledge of building construction and a wide experience of all classes of concrete work, including reinforced concrete framing.

Preference will be given to candidates who are Members of the Institute of Clerks of Works.

The successful candidate will be required to supervise the construction of offices and service centre on a site in the centre of Sheffield, and the work is expected to commence in December, 1958, and to last for three years.

Salary £930 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial Street, Sheffield, not later than 14th November, 1958. 5263

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

APPLICATIONS are invited for the following appointment in this Division :—

ASSISTANT SHIFT
CHARGE ENGINEER,
DRAKELOW "A" POWER STATION
(Vacancy No. 159/58/ER).

Applicants should have suitable technical qualifications and experience in power station operation.

Salary will be within Class J, Grade 8 (£995-£1,055 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 12th November, 1958.

This appointment will be pensionable under the terms of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, Central Electricity Generating Board, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. PLEASE QUOTE VACANCY NUMBER.

O. S. WOODS,
Divisional Controller.

22nd October, 1958. 5275

JOSEPH LUCAS (ELECTRICAL) LIMITED

ASSISTANT ELECTRICAL
DESIGN ENGINEER

required for the design of rotating electrical machines and electro-magnetic devices. Projects will include fundamental design investigations, and full scope will be given for initiative and imagination.

The post is permanent and pensionable.

Apply in writing stating age, qualifications and experience to the Personnel Manager, Joseph Lucas (Electrical) Limited, Great King Street, Birmingham, 19, quoting reference PM/D/221.

125

AIR MINISTRY

STATION ENGINEERS (G.D.) and STATION ENGINEERS (Mech.) required at R.A.F. and M.T.C.A. Stations. Qualifications required: (a) O.N.C. Elec. or Mech. or equivalent; (b) recognised apprenticeship in electrical or mechanical engineering with firm or establishment of good repute; (c) 3 years' employment in electrical or mechanical engineering, preferably on operation and maintenance of mine, factory or workshops plant and services. Preference given to candidates with supervisory experience subsequent to (b) and (c).

Work consists of installation, operation and maintenance of high and medium-voltage electrical distribution system electrical installation, generating plant, steam and hot water heating systems and miscellaneous works plants, tools and equipment.

Commencing salary according to age, qualifications and experience on range £655-£820. Promotion and pensionable prospects and opportunities for overseas tours for which special allowance payable in addition to higher salary.

Applications normally from natural-born British subjects only, up to age 45 years.

Write giving age, full details of qualifications and experience, quoting (PE.3140), to Manager, Ministry of Labour and National Service, Professional and Executive Register, Atlantic House, Farringdon Street, London, E.C.4. 391

SIMPLEX ELECTRIC COMPANY LTD.

have vacancies for Technical Staff at

THE CREDA DESIGN CENTRE

in London (adjacent Alperton Underground Station).

Present requirements are for :

PROJECT ENGINEERS: Graduates with ability to foster the development of a product through all stages and with experience of domestic appliances, motorised or otherwise.

DESIGNERS, with experience of domestic appliances and sound knowledge of design for modern production methods.

TECHNICAL ASSISTANT, familiar with engineering laboratory techniques and a real interest in development work.

Written applications with full details of industrial experience and salary expected will be received in strict confidence by the Secretary, Simplex Electric Co. Ltd., Oldbury, Birmingham. 5166

HEAD WRIGHTSON
IRON & STEEL WORKS
ENGINEERING LTD.

require ELECTRICAL DRAUGHTSMEN, senior and junior, for the layout and design of industrial installations comprising power distribution, motor applications, lighting, and allied design work. Experience of iron and steel works practice an advantage but not essential. Excellent working conditions, pension scheme, assistance with house purchase.

Apply — Personnel Manager, Ref. IS/20, Teesdale Iron Works, Thornaby-on-Tees. 5308

EASTERN ELECTRICITY BOARD

Chilterns Sub-Area

SECOND ASSISTANT ENGINEER, BEDFORD DISTRICT (114/58.R). Candidates should have had a sound technical education and suitable experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems, including substations.

Salary N.J.B. Class F, Grade 7 (£885-£930).

The successful candidate will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Apply by letter, within 14 days, to the Manager, Bedford District, Eastern Electricity Board, Prebend Street, Bedford. 5321

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern Division

First Assistant Station Chemist, Blyth "A" & "B" Power Stations

APPLICATIONS are invited for the appointment of FIRST ASSISTANT STATION CHEMIST at Blyth "A" and "B" Power Stations.

Applicants should possess at least a Higher National Certificate in Chemistry, have good experience in modern analytical and physical chemistry, and be conversant with boiler and feed water treatment.

The successful candidate will be expected to assist the Station Chemist in investigational work, both in the laboratory and on the plant.

The salary for the appointment (which is superannuable) will be in accordance with the National Joint Board Agreement, Schedule A, Grade 9, Class L (£1,065-£1,140 per annum).

Forms of application may be obtained from Divisional Establishments Officer, Central Electricity Generating Board, North Eastern Division, Carliol House, Newcastle upon Tyne, 1, to whom they should be returned not later than 10th November, 1958. 5294

TECHNICAL SALES ENGINEER FOR BIRMINGHAM AREA

To be based in Birmingham and represent a division of an internationally established company manufacturing electrical components and equipments. Age 25 to 40 years. Electrical training, commercial experience and a general knowledge of electrical engineering industries in the Midlands is essential. O.N.C. (Elect.) minimum and/or knowledge of metal rectifiers is an advantage.

Straight salary up to £1,000 p.a. according to qualifications, etc., plus expenses. Car provided. Non-contributory pension scheme.

Interviews will be held in Birmingham.

Please write, quoting reference DM.14, stating relevant particulars to Box TS.142, A.K. Advg., 212a, Shaftesbury Avenue, London, W.C.2.

5330

CITY OF BIRMINGHAM PUBLIC WORKS DEPARTMENT

Mechanical and Public Lighting Section

Vacancy for Electrical Engineer Special Grade £750/£1,030 p.a.

APPLICANTS should be Associate Members of the Institution of Electrical Engineers or hold equivalent qualifications.

Candidates should have experience in the design, specification and supervision of contracts for electric lighting and power installation in large buildings.

The post is permanent, superannuable and subject to a medical examination.

Applications stating qualifications, age and experience and naming two referees should reach the undersigned by the 29th November, 1958.

Canvassing disqualifies.

HERBERT J. MANZONI,
City Engineer and Surveyor.

Civic Centre,
Birmingham, 1. 5310

SHROPSHIRE EDUCATION COMMITTEE

SHREWSBURY TECHNICAL COLLEGE
Principal: L. B. Daley, M.A., B.Sc.(Econ.) (Hons.), A.M.B.I.M., F.C.C.S.

GRADE A ASSISTANT required to teach ELECTRICAL INSTALLATION SUBJECTS in City and Guilds courses. Salary £475-£25-£900 with placing on scale for war service, approved industrial experience and teaching experience.

Application forms (returnable as soon as possible but not later than 12th November) and further particulars from the Principal. 5312

Situations Vacant (continued)

CENTRAL ELECTRICITY GENERATING BOARD

London Division

APPLICATIONS invited for following superannuable post. Conditions of service in accordance with N.J.M. and Higher Executive Grades Committee Agreement. Salary includes London allowance. Qualifications entitling to Corporate Membership of I.E.E. or I.Mech.E. an advantage.

POWER STATION SUPERINTENDENT, BARKING A/B POWER STATION (Vacancy No. 58/873).

Sound technical training with wide experience in electrical and mechanical engineering and in power station practice. Candidates must be competent works managers and good organisers, have had experience of negotiating and consultative committees and in the promotion of good labour relations. The officer will be responsible for the general management and operation of the station. Salary Class D, Grade 5 = £2,160/£2,360 p.a.

Applications, quoting vacancy number, to (or on form from) Central Electricity Generating Board, London Division, P.O. Box 136, London, W.1, by 10th November, 1958. 5723

TECHNICAL REPRESENTATIVE

EXPERIENCED
TECHNICAL REPRESENTATIVE
WITH ELECTRICAL QUALIFICATIONS
REQUIRED

to handle the marketing of new range of Electrical Tapes for Electric Motor, Transformer and Generator manufacture and repair. Must have full knowledge of all phases of latest methods of manufacture in the electrical industry, and be qualified to discuss appropriate technical qualities at high level research and development stages.

Applicants must be prepared to cover all manufacturers in Great Britain in the initial stages. Preference given to a Nottinghamshire or near resident. Motor car provided. Good salary and expenses to right man. Permanent position. Pension scheme.

Apply Managing Director, P. P. Payne & Sons Ltd., Haydn Road, Nottingham.

374

SOUTHERN ELECTRICITY BOARD

General Assistant Engineer

MELKSHAM District of No. 2 (Newbury) Sub-Area. Salary N.J.B. Class F, Grade 13 (£590-£635 per annum). N.J.B. conditions of service.

The duties of the post will be to assist with distribution, including minor construction work and general maintenance of H.V. and L.V. overhead and underground distribution systems, substation plant, etc. This appointment may involve standby duties. Applicants should possess suitable technical qualifications.

The successful candidate will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible.

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, Berks, and returned to him, quoting Z.957, in envelopes suitably endorsed, not later than 10th November, 1958. 5305

GRESHAM TRANSFORMERS LTD.

Twickenham Road, Hanworth, Middlesex.

Chief Transformer Designer

AN experienced transformer engineer is required to take charge of the design office of this company. A wide variety of transformer types is now being manufactured, and a recently erected factory has a capacity up to about 10 MVA.

The successful applicant should have good design experience, and, preferably, some administrative experience.

Applications to the Chief Engineer, giving full details of career. 5315

UNIVERSITY OF BRISTOL

Electrical Engineering Department

VACANCIES, both senior and junior, are likely to occur within the next year or two on the academic staff of this department in either the Power or Radio sections of the department. Salaries and conditions will be according to the usual university scales and standards, with initial salary according to qualifications and experience.

The department has recently been transferred to excellent new premises, and substantially re-equipped. Facilities for research are good, especially in electrical machinery and power.

Persons who contemplate seeking a post on the staff of a university department of electrical engineering either immediately or within the next year or two are invited to submit details of their careers and records to date. Submission of particulars will entail no obligation, either to the applicant or to the university.

H. C. BUTTERFIELD,
Secretary and Registrar.

The University,
Bristol. 395

ELECTRONIC DEVELOPMENT ENGINEER

HILGER AND WATTS LIMITED invite applications for the above post from graduate Electrical Engineers or graduates in Physics with a sound knowledge of Electronics.

The successful applicant will be required to work on the design and development of electronically controlled spark generators to be used in the automatic analysis of metals, and should preferably have had some practical experience in the use of high-voltage and radar pulse techniques.

The post offers considerable scope in a progressive organisation with an international reputation.

Applications giving all relevant details should be addressed to :—

The Chief Personnel Manager
HILGER AND WATTS LIMITED
98, St. Pancras Way, London, N.W.1

5272

SILVERTOWN RUBBER CO. LTD.

London, E.14

require an

ELECTRICAL ENGINEER
(aged 27-46)

to be responsible to the Chief Engineer for

Power Station and Generation Electrical Installation.

Conversion from D.C. to A.C. and maintenance.

Candidates with adequate qualifications and experience including power station practice, also instrumentation for press work, should send full particulars to :—

P. K. Brewin (Ref. S.E.E.), Personnel Officer
SILVERTOWN RUBBER COMPANY LTD.
Herga House, Vincent Square
London, S.W.1

5296

SENIOR TRANSFORMER DESIGNER

required with design experience of transformers up to 10 MVA at 33 kV.

Permanent and progressive position with attractive pension scheme.

Write, giving details of experience and salary required to :—

WODEN TRANSFORMER CO. LTD.
Moxley Road, Bilston, Staffs

5297

CENTRAL ELECTRICITY GENERATING BOARD

AN ENGINEER is required in the OPERATIONS BRANCH of the RESEARCH AND DEVELOPMENT DEPARTMENT at LONDON HEADQUARTERS to organise and guide research and development lying mainly in the mechanical engineering field of plant operation. Candidates should possess a University Degree in Engineering and/or Corporate Membership of the Institution of Mechanical Engineers. A creative and practical outlook and experience of research or development work, preferably in power stations or in an industry connected with conventional power generation, is desirable.

The salary for the appointment will be on a scale within the range £2,150-£2,960 p.a. according to duties and responsibilities.

Applications stating age, qualifications, experience, present position and salary should be forwarded to S. S. Scott, Chief Personnel Officer, Central Electricity Generating Board, 24/30, Holborn, London, E.C.1, by 17th November. Envelopes and applications to be marked "Confidential"—Reference ER/327.

5318

CENTRAL ELECTRICITY GENERATING BOARD

Southern Division

GRADE 9 ENGINEER, EARLEY GENERATING STATION, READING (S/13. 1037). Applicants should have had previous experience in a large modern generating station, and preference will be given to those with experience of high operating temperatures and pressures, and pulverised fuel equipment. Manufacturing works experience will be an advantage.

Preference will be given to those who possess qualifications leading to corporate membership of a recognised professional institution, or those holding appropriate equivalent qualifications.

Salary N.J.B. Grade G.9, £835-£880 plus 10% when on shift.

Special application forms, obtainable only from P. D. A. Oliver, Divisional Secretary, 111, High Street, Portsmouth, should be returned by 12th November, 1958. 5319

LANCASHIRE DYNAMO GROUP SALES LIMITED

Sales Engineering Appointments

APPLICATIONS are invited from candidates of H.N.C. standard and with sales experience for the following areas :—

LONDON and NOTTINGHAM :
L.V. switchgear and control gear.

MANCHESTER :
H.V. and L.V. switchgear.

NEWCASTLE, NOTTINGHAM and LONDON :
Industrial electronic control equipment.

LONDON :
Electrical rotating machinery.

The appointments are pensionable and a company car will be provided. Write in strict confidence to the Secretary, Lancashire Dynamo Group Sales Ltd., St. Stephen's House, Victoria Embankment, London, S.W.1, giving details of age, education and training, qualifications and experience. 5280

UNIDARE LIMITED

Finglas, Dublin, Ireland

has a vacancy for a

DISTRIBUTION TRANSFORMER DRAUGHTSMAN.

Applicants should have experience in the draughting of transformers up to 1,500 kVA.

This appointment will carry an attractive salary with the benefit of a non-contributory staff pension scheme and a contributory health insurance scheme.

Apply, quoting reference BGC/DON/MS, giving full details of experience.

5261

YORKSHIRE ELECTRICITY BOARD

No. 7 (Grimsby) Sub-Area

SECOND ASSISTANT ENGINEER (Industrial Development).

Candidates should hold at least the Higher National Certificate in Electrical Engineering and will be required to advise consumers on the utilisation of electricity in industry. They should also have had experience in the negotiation of Supply Agreements with industrial consumers. Experience of street lighting and a knowledge of general tariff structures will be an added advantage.

Salary N.J.B. Class J, Grade 7, £1,065/£25/£1,140 per annum.

Applications, quoting 7 SAR, and giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Road, Grimsby, not later than 14th November, 1958. 5306

TRANSFORMER DESIGN ENGINEER

A SENIOR TRANSFORMER DESIGN ENGINEER is required for a large modern transformer factory in Melbourne, Australia. Applicants must be technically qualified and have had considerable experience in the detailed design of both distribution transformers and power transformers up to 30,000 kVA capacity for voltages up to 132 kV. Recent actual experience in designing transformers using the latest techniques and materials to meet customers' requirements as to performance and tests is essential.

Free passages for successful applicant and family will be provided, together with assistance in obtaining a house.

Starting salary £A.2,000 per year. The company operates a contributory pension scheme.

Reply with full details of age and experience to the Secretary, A.E.I. Overseas Limited, Crown House, London, W.C.2. 5260

Z. E. T. A.

Development Engineers

PROFESSIONAL Electrical Engineers are required at the ATOMIC ENERGY RESEARCH ESTABLISHMENT, HARWELL, to develop equipment for the Zero Energy Thermonuclear Assembly. In addition to professional qualifications, a Degree in Electrical Engineering and experience in design and/or development work in high-voltage equipment, high-current switchgear electrical measurements, or electrical or electronic control gear would be helpful.

Salary £1,300-£1,740 (Engineer II).

Housing and superannuation schemes.

Send POSTCARD to the Group Recruitment Officer (1245/48), U.K.A.E.A., A.E.R.E., Harwell, Berks., for details. 5278

DESIGNER-DRAUGHTSMAN

for design and development of electric wiring accessories. Good electrical training desirable and knowledge of mass production methods advantageous.

A high salary with good prospects for a senior designer with previous experience in this specialised branch of the electrical industry.

Applicants should write stating age, education, experience and salary required, and all letters will be treated in strict confidence addressed to: Ref. T.M., M.K. Electric Ltd., Wakefield Street, Edmonton, London, N.18.

5103

SENIOR DESIGN ENGINEER

required with wide experience of the design of small transformers from milli-watts to 5-kVA capacity.

Full details of past experience, academical qualifications and salary envisaged.

Permanent post with attractive pension scheme.

WODEN TRANSFORMER CO. LTD.

Moxley Road, Bilston, Staffs

5298

MINISTRY OF TRANSPORT AND CIVIL AVIATION

ELECTRICAL ENGINEERS (Assistant Signals Officers) required for aviation telecommunications and electronic navigational aids. Minimum age 23, 1st or 2nd Class Degree in Physics or Engineering, or A.M.I.E.E. or A.F.R.Ae.S. (candidates with Parts I, II and III of A.M.I.E.E. or Parts I and II of A.F.R.Ae.S. or equivalent, or of very high professional attainment without these qualifications considered).

Salary £665 (age 23) to £1,085 (age 34). Maximum £1,250. Slightly lower outside London and for women. 5-day week.

Further details and forms from M.L.N.S., Technical and Scientific Register (K), 26, King Street, London, S.W.1, quoting D129/8A.

397

DRAUGHTSMEN

SENIOR ENGINEERING DRAUGHTSMEN required in our works plant engineering and maintenance department. Applicants, aged 28 or over, should hold H.N.C. or equivalent in one of the following :—

MECHANICAL.
ELECTRICAL.
BUILDING.

Apprenticeship and 5 years' subsequent workshop experience desirable plus originality and flair for design.

Write in confidence with full details to—Siemens Edison Swan Ltd., Ref. 744/33, Woolwich, London, S.E.18. 208

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

ASSISTANT MAINTENANCE ENGINEER (Electrical) is required at Ocker Hill Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade G8, £885-£930 per annum.

Applicants should have received a sound technical training and practical experience in electrical maintenance in a modern power station and the possession of an appropriate technical qualification will be an advantage.

Apply quoting Vacancy No. 879MD on form AE6, available from the Establishments Officer, 53, Wake Green Road, Moseley, Birmingham, 13, by 13th November, 1958. 5317

BRADFORD INSTITUTE OF TECHNOLOGY

Principal: E. G. Edwards, Ph.D., B.Sc., F.R.I.C.

APPLICATIONS are invited for the new post of SENIOR TECHNICIAN in the Department of Electrical Engineering.

Candidates should possess an Ordinary National Certificate or a City and Guilds Final Certificate in Electrical Engineering or Telecommunications.

Salary scale £625 × £20 to £745 (with efficiency bar at £685).

Further details and forms of application may be obtained from the Principal, Bradford Institute of Technology, Bradford, 7.

W. H. LEATHEM,
Clerk to the Governors.

5244

APPLICATIONS invited, preferably from natives of the territory, for the position of technical sales representative in Scotland and the North-East Coast of England. A knowledge of the electrical industry is essential and knowledge of the electrical insulation industry would be an advantage. Staff pension scheme, salary, commission, expenses and motor car supplied. Write with full details of previous experience to—Executive Director, Langley London Ltd., Kelvin Way, Crawley, Sussex. 5324

ASSISTANT draughtsmen, experienced, for lighting and power schemes for hospital, office and school buildings, also specifications. Annual bonus, five-day week and 3 weeks' holiday. Consulting engineers, Holborn (London) area.—Box 5284.

ASSISTANT electrical engineer/draughtsman, 23/27, with at least O.N.C. qualifications, experienced in estimating and contract work for mechanical handling plant. Practical experience of control system desirable. Pension fund. Sports and canteen. Particulars of experience, qualifications and salary required to—W. J. Jenkins & Co., Retford, Notts. 5094

ARON ELECTRICITY METER invite applications for the position of indoor sales engineer. Applicants are required to have a sound technical background, preferably applied to electricity meters and electronic equipment. Superannuation scheme in operation. Applicants should supply full details of experience, age, and salary required, and replies, which will be treated in the strictest confidence, should be marked "Personal" to the General Sales Manager, Aron Electricity Meter Limited, 72-82, Salusbury Road, London, N.W.6. 5161

ASSISTANT electrical engineer. Electric motor control gear manufacturers require young assistant in design office with knowledge of electronics. Progressive position, contributory pension scheme.—Box 5246.

ASSISTANT engineer required for large London contractors. Excellent prospects and permanent position for intelligent young man with initiative. Write giving full details to—Box 5283.

BRITISH ENGINE BOILER & ELECTRICAL INSURANCE Co. Ltd., 24, Fennel Street, Manchester, 4. The company has vacancies for electrical surveyors for various districts in Great Britain. Permanent positions carrying progressive salary scale £735 to £1,060 and non-contributory pension. Candidates, age 26 to 32, preferably with H.N.C. in Electrical Engineering or Grad. I.E.E. and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply in own handwriting, stating age, qualifications and experience. 5285

CABLE manufacturer (independent) requires representative for Home Counties, preferably experienced in thermoplastic cables and with connections throughout electrical industry. —Box 5208.

CONTRACTS/sales engineer required for a senior appointment in a switchgear company in South Africa. Must have at least 4/5 years' contract/sales experience on switchgear installations up to and including 66 kV. Education up to Higher National Certificate level would be an advantage. Minimum period of engagement 3 years. Passage paid. The salary offered is between £120/£140 per month. Applicants should apply stating age and experience to—Box 5299.

COUNTER assistant required for wholesale electrical department. Experience essential. Apply with references to—Messrs. Wm. Dibben & Sons Ltd., East Street, Farnham. 5286

COUNTER assistant required for wholesale electrical department. Experience essential. Apply with reference to—Messrs. Wm. Dibben & Sons Limited, 62, Commercial Road, Southampton. 5209

DESIGNER (junior) required for lighting fittings. Previous experience in this field essential and knowledge of perspective an advantage. Full details—Troughton & Young (Lighting) Ltd., 2, Basil St., London, S.W.3. 5325

DESIGNER required for development work on low-voltage air circuit breakers. Housing accommodation available to suitable applicant. Applications giving age, experience, qualifications, etc., to the Personnel Manager, which will be treated in strict confidence, to—Box 5188.

DRAUGHTSMEN for South Manchester office. Interesting work on layouts and diagrams, 33 and 11-kV switchgear, transformers, cables, etc. Apply — South Wales Switchgear Ltd., Rex Buildings, Wilmslow, Cheshire. 5287

EKCO-ENSIGN ELECTRIC Ltd. require experienced lighting engineer for London office. Must be well educated and conversant with modern lighting methods. Apply—Senior Lighting Engineer, 45, Essex Street, London, W.C.2. 5288

ELECTRICAL detail draughtsman, age 21-23, with Ordinary National Certificate. Pension scheme. Please give full particulars of experience and salary required to—W. S. Atkins & Partners, 52, Frederick Road, Edgbaston, Birmingham, 15. 5262

ELECTRICAL eng. company have vacancy for young draughtsman in their engineering dept. Experience in the design and development of lighting fittings preferred. Apply in writing to the Chief Engineer, Lamps and Lighting Division, Siemens Edison Swan Limited, 28/30 Upper Thames St., London, E.C.4. 5249

ELECTRICAL engineering assistant reqd. with expce. of maintenance of electric lifts or similar equip. Pens. Salary up to £860. Promotion prospects for those obtaining H.N.C. (elec.). Applic. form from Chief Engineer (58/94), L.C.C., County Hall, London, S.E.1. (2060) 5248

***Situations Vacant** (continued)*

ELECTRICAL engineer required by West Midlands firm for work in development laboratory on discharge lamp circuits and control gear. H.N.C. or equivalent qualification desirable.—Box 5247.

ELECTRICAL manufacturing company in London requires an electrical engineer familiar with discharge lamps, associated control gear and capable of working in liaison with research laboratories and factories on design and development of associated control gear and equipment. Must be capable of carrying out lighting experimental field trials and be able to act in a technical advisory capacity. Apply in writing to the Chief Engineer, Lamps and Lighting Division, Siemens Edison Swan Ltd., 38/39, Upper Thames St., London, E.C.4. 5250

FOREMAN electrician required. Duties will include the supervision of all types of domestic and industrial electrical and wiring installations, and of organising and controlling manual labour. Conditions of service and salary £665 per annum, Schedule E, Grade 2, plus £26 per annum productivity allowance after one month's service, in accordance with N.J.I.C. Agreement. Apply by letter, stating age, experience and present position to the District Manager, Midlands Electricity Board, 15/17, Bridge Street, Banbury, Oxon. 5323

FOSTER TRANSFORMERS Ltd., South Wimbledon, London, S.W.19, have vacancies for testers for work on all types of transformers up to 3,000 kVA. Applicants should have had some training or experience in the electrical industry. Apply in first instance giving details of experience and salary required to the Personnel Officer. 5174

IF you reside in the London area, have technical experience in medium-voltage airbreak switch and distribution gear, are 35 to 40 years of age, with experience and contacts with electrical consultants and architects, and are interested in joining a well-known manufacturer's sales staff to work from London office as a technical representative, there is a very interesting position available. Write to—Box 5289.

LADY tracer required for electrical accessory manufacturers. Must be a neat worker and capable of small intricate drawings. Good timekeeping is essential. Written applications in the first instance to—T.M., M.K. Electric Ltd., Wakefield Street, Edmonton, London, N.18. 5251

LIGHTING engineer required for the preparation of lighting schemes. Excellent prospects and good conditions; canteen facilities available. Please reply with full details as to experience, age and salary expected to—Herman Smith Smithlite Ltd., Empire Works, Dudley. 5252

LONDON E.W.F. wholesaler requires immediately young man in pricing office. Only those with previous experience should apply. Give full particulars in confidence to—Box 5191.

OVERHEAD foremen and linesmen wanted for pole work up to 33 kV. Good hours, permanent position, London rate for right people.—Box 5177.

OVERHEAD line engineers required for consulting engineers' staff in Scotland, with opportunities overseas service later, age group 25-35 preferred. Dual experience steel tower lines up to 132 kV and wood pole construction up to 33 kV desirable. Applicants please send outline of technical training and overhead line experience to—Kennedy & Donkin, 3, North Charlotte Street, Edinburgh, 2. 5264

REPRESENTATIVE required, progressive electrical wholesaler. Experience and existing connection with contractors and industrial users essential. Salary, commission and expenses. Car provided. Write details—Finch Wholesale Electrics Ltd., 550, Ley Street, Ilford. Essex. 5234

REQUIRED for trade association, assistant aged 25-35 with engineering background, preferably in the electrical manufacturing industry. Ability to work independently necessary. State technical experience and salary required. —Box 5235.

ROTATING electrical machine designer required to head newly formed research and development dept. Splendid opportunity for experienced man with ambition. Age preferably between 28 and 35.—Box 5253.

SENIOR supervising electrical engineer required for large London contractors. Good prospects and permanent position. Write giving full details to—Box 5282.

R. B. PULLIN & Co. Ltd. wish to appoint an experienced representative for their new thermostat division to cover Lancs, Yorks and the North of England. Applications stating age, experience and salary required should be addressed to — Sales Manager, Thermostat Division, Phœnix Works, Great West Road, Brentford, Middlesex. 5300

SALES department. Enthusiastic young man required by a firm manufacturing electrical rotating machines to take a leading position in sales department. Apply in confidence giving full details of previous experience, age and salary.—Box 5254.

SERVICE engineer required for company manufacturing full range of electricity meter products. Experience of electricity meters desirable but not essential. Applicants must have sound technical background and be prepared to travel throughout the British Isles. This position offers first-class opportunities for further advancement. Applicants should supply full details of experience, age and salary required. Car supplied and superannuation scheme. Replies, which will be treated in the strictest confidence, should be marked "Personal" to the General Sales Manager, Aron Electricity Meter Limited, 72-82, Salusbury Road, London, N.W.6. 5160

STOREKEEPER. Must be thoroughly experienced and only those who have worked for an electrical wholesale company for many years need apply. Applications by letter only stating full details.—Halsey's Electric Co. Ltd., Brandon House, Wyfold Road, Fulham, London, S.W.6. 5179

TECHNICAL assistant required by important company in the Midlands manufacturing all classes of cable and bus-bar trunking, and associated equipment. Successful applicant will be required to prepare layouts and quotations and co-operate with the design staff. Interesting and progressive post for man with initiative. Applications will be treated in strict confidence. State age, full experience and salary required to —Box 5326.

TRAVELLERS required for electric cable manufacturers, South Eastern Counties. Write details of connections, etc.—J. Day & Co., Harrow Manorway, Abbey Wood, London, S.E.2. 5301

X-RAY service engineers required for London and the Home Counties. Must be experienced in the installation and maintenance of medical X-ray equipment. Apply in writing giving full details of training, experience and present salary to A. E. Dean & Co. (X-Ray Apparatus) Ltd., Progress Way, Croydon, Surrey. 5193

YOUNG engineer is required by a contracting firm operating in South and East England. Applicants should have some experience of the supervision of high and low-voltage cable laying and jointing, and switchgear erection. The applicant will have the opportunity of furthering his experience in the above field and also in that of estimating for large and varied projects.—Box 5265.

APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

SITUATIONS WANTED

ADVERTISER, many years with well-known London electrical contractors, desires change. Extensive administrative experience in all branches including staff control. Only progressive post with good remuneration considered.—Box 9523.

ELECTRICAL and mechanical engineer, erection and running diesel power stations and networks up to 11 kV, ten years Middle East, available end of year, desires overseas position. Married, age 43. English. — Box 9525.

ENGINEERING sales manager, A.M.I.E.E. (34). single, seeks further executive appointment in Singapore, Malaya, Indonesia or Hong Kong. Comprehensive engineering/commercial experience in wide range of electrical and mechanical plant, etc. First-class references. Available early January, 1959.—Box 9513.

EST./supervising engr. desires change, pref. Southern area. Fully exp. contracts, enquiry to final acct. including sales. Progressive position essential.—Box 9522.

EXPERIENCED sales engineer, age 40 years, 26 years electrical trade, seeks change as sales manager or senior sales engineer. Excellent connections Govt. dept. boards, public bodies, big users, wholesalers.—Box 9517.

SALES engineer (technical), fully conversant with A.C./D.C. control gear and motors. Able to work on own initiative. Top level connections throughout British Isles, including all government departments. Position to be of executive status. Preferably operation from West Country.—Box 5290.

ARTICLES FOR SALE

NEWMAN

ONE new 1949 ENGLISH ELECTRIC Model 8RL Vertical Diesel Engine only, 1,000/1,144 b.h.p., 375/428 r.p.m., 800 kVA, 428 r.p.m.. Alternator and switchgear available.

TWO new 1950, 493-kVA PETTER/BRUSH Diesel-driven Alternator Sets, 600 r.p.m., 400/3/50 cycles, 4-wire output, with switchgear.

TWO new 1948, 236-kVA CHICAGO PNEUMATIC/L.D. & C. Diesel-driven Alternator Sets, 600 r.p.m. for 400/3/50 cycles, 4-wire output, with switchboards and synchronising panel.

ONE 220-kVA GENERAL MOTORS Model 8/268 Diesel-driven Alternator Set, 1,000 r.p.m. for 415/3/50 cycles, 4-wire output, with switchgear.

ONE 62½-kVA PAXMAN Model 5RW Diesel Alternator Set, 1,000 r.p.m. for 400/3/50 cycles, 4-wire output, with switchgear.

ONE 110-h.p., 350-r.p.m. CROSSLEY twin-cylinder vertical Diesel Engine only, Model RVD2, with shaft extension and outer pedestal bearing.

All available for early despatch.

NEWMAN INDUSTRIES LIMITED
Yate, Bristol
(Telephone: Chipping Sodbury 3311)
5291

T.W.W.

Large A.C. Motors
3-phase, 50 cycles

Maker	H.P.	Volts	R.P.M.
B.T.H.	1820	3.3 kV	368
B.T.H.	1800	400/440	368
MATHER & P.	350	400/440	720
METRO-VICK.	310	400/440	1440
MATHER & P.	300	400/440	720
BRUSH	250	400/440	420
B.T.H.	250	400/440	480
MATHER & P.	200	400/440	960
BROOK	110	400/440	580

THOS. W. WARD LIMITED
Albion Works, Sheffield
(Phone 26311, ex. 347; Grams, "Forward")
321

ELECTRICAL EQUIPMENT FOR SALE

BATTERY of 6 HARLAND HI-VE Switchgear, type 3, 11 kV, 400 amps., 3-phase, 50 cycles.
2 BRUCE PEEBLES 100-kVA Transformers, 10,750/400 v.
1 BRUCE PEEBLES Rectifier Transformer, 1,075/400 v.
1 BRUCE PEEBLES Rectifier, 50 kW, 480/240 v. D.C.
1 BRUCE PEEBLES Spare Cooling Fan, 240 volts D.C.
1 E.E.C. Spare Valve.

Can be seen in operation by arrangement with Mr. J. Weed, H.C.B.S. Ltd., 43, Union Street, Hamilton. 5212

ELECTRIC HOUSE SERVICE METERS

PREPAYMENT and credit, 200/250 v. A.C., s/p., 50 c., 2½-100 A. Fixed or variable tariff. Reconditioned, fully tested and guaranteed 2 years. Prompt delivery, carriage paid.

ALBERICE METER COMPANY
Fairfax Works, Fairfax Rd., London, N.8
(Tel. MOUntview 7944, 6373) 191

HOUSE SERVICE METERS

200-240-v. A.C. or D.C., 10 amps. capacity, quarterly type, from 25s. each, plus 2s. 6d. carr.

UNIVERSAL ELECTRICAL CO.
221, City Road, London, E.C.1 37

SMOOTHED A.C. to D.C. RECTIFICATION

COMPLETE range of smoothed transformer rectifier units with choke condenser filtering giving low ripple content.

Short deliveries from standard range, up to 60 volts and 50 amps.

Further details on request against specific requirements.

AUTOSLAVE EQUIPMENT LTD.
1-3 and 5, Broad Street, Northampton
209

A.A. ELECTRICAL Co. for A.C.-D.C. motors, switchgear, exhaust fans, hoists, reduction gears, new or reconditioned units.—CHI. 5105. 67, Rothschild Rd., London W.4. 57

BABCOCK & Wilcox water tube boiler will cut down your fuel costs; we can supply from stock. Two 40,000 lb. evap., 220 lb. w.p.; one 25,000 lb. evap., 200 lb. w.p.; 3,000 lb. evap., 400 lb. w.p.; Spencer Bonecourt boiler; also Marine, Cornish vertical, etc.—Burford, Taylor & Co. Ltd., Boiler Specialists, Burtayco House, Church Street, Middlesbrough (Tel. Middlesbrough 2622). 122

A.C. and D.C. motors, generators, from stock.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. (Edgware 5566/9). 91

A.C. and D.C. 1/- slotmeters. Guaranteed 2 years, 2½-50 amps. From 50/-. Repairs and recalibrations. See Billiard: Tradex Meter Co., Surbiton (Tel. Elmbridge 4487). 169

ALTERNATORS from ½ to 675 kVA in stock, single and three-phase, all voltages and frequencies. Guaranteed. Many unused. Send your requirements.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 162

ALTERNATORS, generators, 1-588 kVA, all voltages. Specialists—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 147

ALTERNATORS, 3-phase, all sizes in stock from 7 kVA up to 330 kVA.—Britannia Manufacturing Co. Ltd., 20/26, Britannia Walk, London, N.1 (CLErkenwell 5512). 24

BARGAINS in electric motors from A. Cooksley & Co. Ltd., 21/25, Tabernacle Street, London, E.C.2. Ring Monarch 3355. 50

BILLIARD Meters. 1/-, 6d. or 1d. slot. All time settings. From 140/-. See Quarterly.—Tradex, Surbiton. 170

CABLE, underground, all types ex stock.—E. M. Tatton Co., Ltd., Kew Bridge, Brentford (EALing 3155/6). 117

CABLE, underground, PILC/VIR/LC, ex London stock. Cutting orders same day delivery London area. Send for priced stock lists. — Batt Electrical Co., 6, Dock Street, London, E.1 (Tel. ROYal 5905). 316

CIRCUIT breakers, various sizes in stock, A.C. and D.C., 200 amperes up to 2,000 amperes. Also dynamo and alternator switchboards. — Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 26

CONVERTERS and motor-alternators, 24, 110 and 220 v. D.C. to 230/1/50 A.C., 300 watts to 6 kVA in stock.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 150

CRANE motors. Direct current, series wound or compound wound, all voltages. We have large stocks.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 22

DIESEL generating sets, all sizes to 500 kW. Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 16

ELECTRIC lamps (best-known makes), ex-Govt., including special voltages, 15, 25, 40-w., from 9d.; Torch bulbs from 6s. per 100. Lists on request.—Suplex Lamps Ltd., 239, High Holborn, London, W.C.1 (HOL. 0225). 5156

ELECTRIC motors, dynamos, alternators and motor generator sets of all sizes. We hold one of the largest stocks in England. New and reconditioned, with 12 months' guarantee.—Britannia Manufacturing Co. Ltd., Britannia Walk, London, N.1 (Clerkenwell 5512, 3 lines); also Works and Stores, Chobham, Surrey. 20

ELECTRIC motors, generators, control gear, transformers, A.C. and D.C., new and reconditioned; all covered with our usual 12 months' guarantee; large stocks available.—Electropower Co. Ltd., Kingsbury Works, Kingsbury Road, London, N.W.9 (Colindale 4621-2). 42

ELECTRIC motors, generators, motor generator sets, transformers, switchgear, etc., large comprehensive stock, overhauled and guaranteed. Copy of our Register, "Electrical Surplus," containing thousands of items of electrical plant, sent on request.—R. F. Winder Ltd., Belgrave Electrical Works, Leeds, 2. 54

ELECTRICIANS. Send for details Shaftesbury lightweight "Bantam" ladders. Top sections fitted with patent moulded rubber blocks, eliminate possibility of scratching or marking walls, fascias, and other painted or highly polished surfaces. Also available for immediate delivery, steps, platform steps, trestles, telescopic trestles, pole and builders-type ladders, and all sizes of two and three-section extension ladders.—Shaftesbury Ladders Ltd. (E.R.), 453, Katherine Road, London, E.7 (Phone: Grangewood 3363/4). 111

EQUIPMENT for sale: Fuller Ward Leonard set, input 90 h.p., 400/3/50, output 0/460 volts, 150 amps., Ellison starting gear; Crom.-Park. slipring motor, 90 h.p., 400/3/50, 1,400 r.p.m., b.b., Ellison starting gear; Brush D.C. generator, 460 volts, 55 kW, 1,400 r.p.m., b.b. Cheap for quick sale.—A. C. Dibley & Co. Ltd., 72, Granville Road, London, N.W.2 (Tel. Meadway 2251). 5168

FIVE 5-ft. fluorescent fittings, 4 4-ft. ballast units, 2 100-VA transformers, 5-ft., 4-ft. and 2-ft. tubes (50 in all), 20 1-kW fire bars, 2 electric hand blowers, 50 4-ft. Paxolin tubes, 40 converter switches, £18 the lot. 1 G.E.C. ½-h.p. motor, 1 1/10 and 1 1/20 Carter motors, 4 Klaxon motors, all new, £7 the lot.—Telephone, EALing 2666 (mornings). 9524

FLAMEPROOF fluorescent fittings, 5 ft., 80 watts, by Revo, Cat. No. C.11474, as new. Large quantity available at less than half list price. Further details from — Leighton Warehouse Co. Ltd., 6, Church Road, Linslade, Leighton Buzzard (Tel. No. L.B. 3400). 9512

FLAMEPROOF Revo fluro. fittings, 5 ft., very cheap.—14, Camberwell Rd., London, S.E.5 (ROD. 4177). 5327

FLUORESCENT fittings, lamps, starters and control gear for home and export. Fully guaranteed by actual manufacturers. Send for catalogues. — The Anglo-American Electrical Company, Olive Street, Bury, Lancs. 245

FLUORESCENT tubes reconditioned and guaranteed as new for 7s. 6d. each. Free collection and delivery in Lancs and Yorks.—The Anglo-American Electrical Company, Bury New Road, Breightmet, Bolton, Lancs. (Telephone, Bolton 7251). 212

FOR sale, motor generator, rotary converter and Ward Leonard sets in a great range of outputs, speeds and control systems.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 161

FREQUENCY changers and variable frequency M/A sets in stock, and to specification.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 148

GENERATING plants of all types, new and reconditioned up to 100 kVA in stock. Special plants built to order at short notice; automatic mains failure, etc. — Powerco Ltd., 312, York Rd., London S.W.18 (VAN. 5234). 151

GENERATING sets for sale, petrol, diesel and steam, from 1 kW up to 700 kW, A.C. and D.C. switchboards.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 163

HIGH frequency alternators and converters, 400 to 2,600 cycles up to 6 kVA in stock. Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 149

LANCASHIRE Dynamo & Crypto alternator, 48 kVA, p.f. .8, 3-phase, 50 cycles, 400 v., 600 r.p.m., complete with exciter. Mftd. 1932.—Smith Brothers (Leicester) Ltd., Batten St., Aylestone Road, Leicester. 5213

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MOTOR generators of all types in stock and to specification up to approx. 100 kW.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 152

MOTORS and control gear, huge stocks all types, ½ to 200 h.p.—Ramsbottom & Co. Ltd., Elec. Engineers, Keighley (3774/5/6). 70

NAMEPLATES, engraving, diesinking, stencils. — Stilwell & Sons Ltd., 153, Far Gosford Street, Coventry. 108

PHASE converters, single to three-phase, several sizes in stock up to 90 h.p., 3-phase loading. — Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 29

PLATING dynamos and motor generator sets, various sizes from 500 amps. up to 2,000 amps., with A.C. and D.C. motors.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 15

POLYPHASE kilowatt hour meters. Available from stock.—Universal Electrical, 221, City Road, London, E.C.1. 40

PREPAYMENT 1s. slot house service meters. —Universal Electrical, 217-221, City Road, London, E.C.1. 36

PURLEY chokes and ballasts. Our 80-w. tapped h.p.f. ballast with starter switch-holder incorporated is proving itself the most popular unit. Suitable for most fittings, 57s. 6d. each subject. — F. F. Blanshard Ltd. (Dept. ER), Purley, Surrey (Uplands 4818/9). 52

QUARTERLY credit meters, single and poly-phase, 2½-100 amps. From 17/6d. Also D.C. See Television.—Tradex, Surbiton. 171

RECONDITIONED motors, ¼ and ½ h.p.; when new £6, accept £2 10s. each. Write —S.P.E. Co., 165, Bermondsey Street, London, S.E.1. 5266

RECTIFIER, 40-kW Hewittic, 400/3/50, input 460 volts D.C., output 87 amps., bulb type, fan cooled, with outgoing D.C. circuit breaker, complete transformer. Two at £175 each.—C. M. Hartshorne & Co. Ltd., Standard Eng. Wks., Meltham, nr. Huddersfield (Tel. Meltham 537). 9519

ROTARY converters in stock, all sizes; enquiries invited. — Universal Electrical, 221, City Road, London, E.C.1. 34

SECONDHAND electrical plant can be as good as new if you buy it from specialists. Write for our stock list.—Dynamo & Motor Repairs Ltd., North End Road, Wembley Park, Middlesex (Telephone, Wembley 3121); Soho Road, Handsworth, Birmingham (Telephone, Birmingham Northern 0898). 73

SLYDLOK fuses for sale.—Ryness Supplies, 37, Goodge Street, London, W.1. 284

SMALL BR screws and nuts in steel, brass and stainless steel, from stock.—Premier Screws & Repetition Co. Ltd., Woodgate, Leicester. 180

TELEVISION slotmeters and time switches. Details from: Tradex Meter Co., Surbiton. Elmbridge 4487. 172

TIME switches from stock. Reconditioned or new. 12 months' guarantee. Lists from—J. W. Hughes, 3, St. Thomas Street, London Bridge, London, S.E.1 (Tel. HOP 2759). 178

TWO lengths cable on one drum, bottom length 66½ yards, top length 33½ yards, size .06 L.T., 4-core, paper insulated lead covered, bedded, single wire armoured and served, 1,100 volts, to B.S. 480, 1954.—Kendall's, 7, Croydon Road, Caterham Valley. 5328

USED line vice, climbers, belt, £2 each item. —Box 9518.

VENNER time switches, 200-240 v. A.C./D.C., 10-50 amps., from stock.—Universal Electrical Co., 221, City Rd., London, E.C.1. 38

WARD Leonard motor generating sets, all sizes.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1 (Tel. Clerkenwell 5512). 10

6-kilowatt Lister fully automatic generating plant, 230 volts, with line batteries, 4.5 kilowatt and 1.5 kilowatt in parallel, in excellent condition. For arrangements to view and offers apply to the Secretary, Hawick & District Eventide Homes Limited, Municipal Buildings, Hawick (Telephone, Hawick 2347). 5267

100 dozen G.E.C. white wood blocks, 4½" × 1", new, price to clear, 6d. each; Electric lamps, 15, 25, 40 w., 200, 210, 220, 230 v. (ex-Govt.), 9d.; Numerous other bulbs and lamps at lowest prices; Torch bulbs from 6s. per 100. Trade list.—Suplex Lamps Ltd., 239, High Holborn, London, W.C.1. 5256

400-cycle to 1,500-cycle motor alternators and alternators.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 27

500-kW, 220-volt Met.-Vick. rotary converter, with transformer 11,000 volts, 3-phase, 50 cycles, and accessories.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 17

600-ampere Met.-Vic. oil circuit breakers, T.P., 400/3/50, cubicle type, volt and ammeter, etc. Several at £75 each.—C. M. Hartshorne & Co. Ltd., Standard Eng. Wks., Meltham, nr. Huddersfield (Phone, Meltham 537). 9520

EQUIPMENT FOR HIRE

GENERATING set hire service. Consult the most experienced firm for A.C. and D.C. units from 2 kW to 240 kW, diesel or petrol, stationary or mobile, sale or hire. 24-hr. breakdown service. — Dawson-Keith Ltd., Hillview Rd., Sutton, Surrey (Fairlands 4401). 46

Equipment for Hire (continued)

RELIABLE, self-contained diesel electric generating sets for hire, 2.5 to 260 kW. Night and day maintenance service. Quotations by return. — Whitetrade Limited, Rochester, Kent (Tel. Chatham 41133, 3 lines). 294

ARTICLES WANTED

ELECTRIC motor required, A.C. slipring, 415 volts, 3-phase, speed 720 r.p.m., 120 to 200 h.p. Offers to—Box 5268.

HARRINGTON & Sons, reclamation contractors, want redundant A.C./D.C. electric motors and transformers, stocks of cable, etc.—109, Beaconsfield Street, New Beckton, East Ham, London, E.6 (ALB. 1388). 315

MERCURY (Quicksilver) wanted. Write for packing instructions. Gold, silver and platinum also purchased.—Collingridge & Co. Ltd., Riverside Works, Riverside Rd., Watford (Tel. 5963). 114

QUICKSILVER & beryllium copper urgently required for best prices and prompt cash.—Sterling Products Ltd. (Ealing 9248). 293

SURPLUS laminations, enamel copper wire, screws, nuts, flex. Good prices paid. Full details to—Box 199.

WANTED, D.C. and A.C. ball-bearing motors, motor generator sets, dynamos and alternators. Full details to — Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1. 13

WANTED for prompt cash, ferrous and non-ferrous scrap, also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. & H. Cooper Ltd., 176, Brady St., Bethnal Green, London, E.1. 120

WANTED, rotary converters, any sizes.—Universal, 221 City Rd., London E.C.1. 35

WANTED, surplus stock cable, all types and sizes. We can inspect.—Box 220.

WORK WANTED AND OFFERED

A.C. and D.C. motor rewinds and repairs. Prompt service, fully guaranteed.—Edgware 5566/9; Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. 92

METAL spinnings to your requirements. A.I.D. approved. — Martin-Golod Ltd., Maybury Gardens, London, N.W.10 (WILlesden 3888). 377

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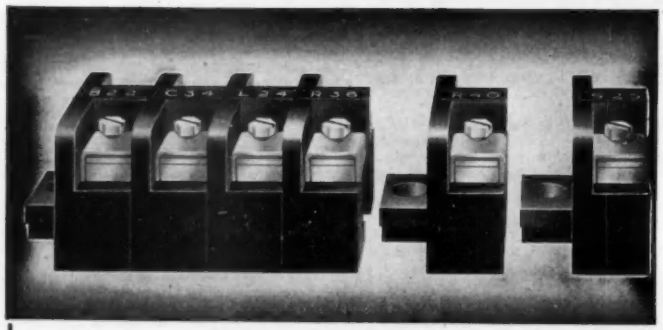

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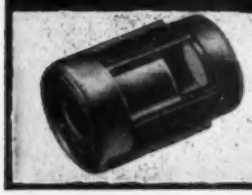

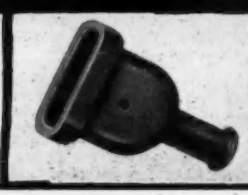

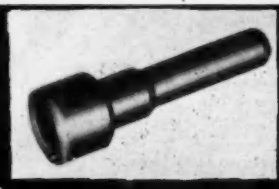

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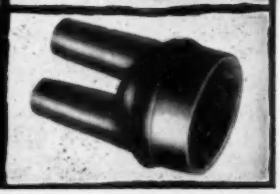

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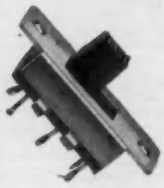
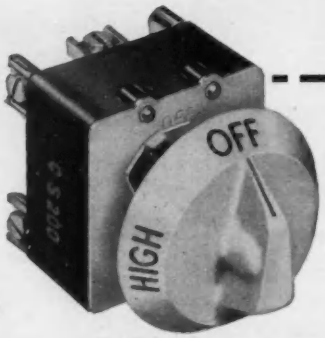
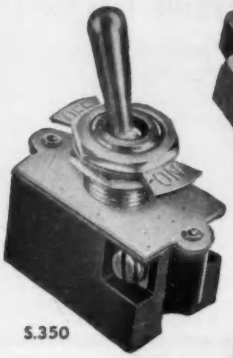


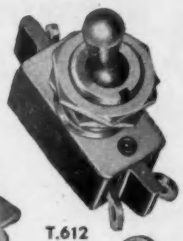
T.225



C.S.200

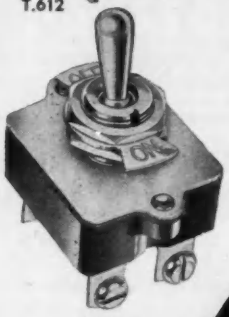


S.350

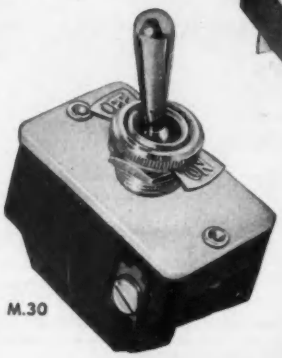


T.612

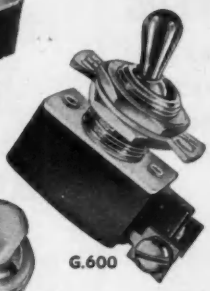
T.280



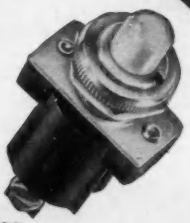
S.254



M.30



G.600



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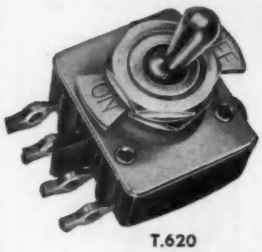

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Airscrew Co. & Jicwood Ltd. 95
Aluminium Union Ltd. 84
Anglo-American Vulcanised Fibre Co. Ltd. 79
Arcolectric Switches Ltd. 115
Armorduct Cable Co. Ltd. 118
Atlas Lighting Ltd. 13
Austinlite Ltd. 50

Banner Electric Co. Ltd. 68
Bayliss, Jones & Bayliss Ltd. 54
Benjamin Electric Ltd. 97
Beresford, James, & Son Ltd. 28
Bill Switchgear Ltd. 3
Birch, H. A., & Co. Ltd. 117
Brass & Alloy Pressings (Deritend) Ltd. 103
Bray, E. N., Ltd. 47
Brentford Transformers Ltd. 52
British Driver-Harris Co. Ltd. 22
British Klockner Switchgear Ltd.. 96
British Thomson-Houston Co. Ltd. 5
Brookhirst Switchgear Ltd. 27
Brotherhood, Peter, Ltd. 48
Brown, N. C., Ltd. 96
Bruce Peebles & Co. Ltd. 18
Brush Electrical Eng. Co. Ltd. 60
Bryce Electric Construction Co. Ltd. 81
Bull, John, Rubber Co. Ltd. 46

Cable Makers Association 44
Chloride Batteries Ltd. 87
Clarke, H., & Co. (Manchester) Ltd. 28
Colne Switchgear (K & W) Ltd. ... 16
Contractors, Electrical, Regional Guide to ..... 101 & 102
Coughtrie, J. & G., Ltd. 43
Cox-Walkers Ltd. 60
Crabtree, J. A., & Co. Ltd. 39
Cressall Mfg. Co. Ltd. 68
Critchley Bros. Ltd. 27
Crofts (Engineers) Ltd. ..... 74 & 75
Crompton Parkinson Ltd. ..... 45 & 82
Cryselco Ltd. 6
Curtis Mfg. Co. Ltd. 24

D.P. Battery Co. Ltd. 70
Dacier Ltd. 76
Daly (Condensers) Ltd. 67
Dubilier Condenser Co. (1925) Ltd. 65

E.F. Electric Ltd. 40
Electric Depôt Ltd. 95
Electric Elements Co. 24
Electro Mechanical Mfg. Co. Ltd.... 25
Ellison, Geo., Ltd. 89
Eltron (London) Ltd. 117
English Electric Co. Ltd. ..... 11 & 59
Evans, F. W., Ltd. 19
Everett Edgcumbe & Co. Ltd. 62
Excelall Metal Workers Ltd. 16

Ferranti Ltd. 69
Fibreglass Ltd. 9
Field & Grant Ltd. 53
Fitter & Poulton Ltd. 117
Flexello Castors & Wheels Ltd. 31
Frost, N. T., Ltd. 80

Gaskell & Grocott Ltd. 68
Geipel, W., Ltd. 16
General Electric Co. Ltd. Cover *1*, 17, 36, 37 & 104
Godwin, H. J., Ltd. 116
Greenwood Airvac Conduits Ltd. ... 23
Griffiths, Gilbart, Lloyd & Co. Ltd. 40
Guide to Electrical Contractors, Regional ..... 101 & 102

Hackbridge & Hewittic Electric Co. Ltd. ..... Cover *4*
Harboro' Rubber Co. Ltd. 114
Harvey, G. A., & Co. (London) Ltd. 86
Hawke Cable Glands Ltd. 48
Heatrae Ltd. 1
Heaven, Dowsett & Co. Ltd. 86
Hendrey Relays Ltd. 72
Heys, Leonard, Ltd. 116
Howden, James, & Co. Ltd. ..... Cover *3*
Howells (Electric Motors) Ltd. 64

Injection Moulders Ltd. 76

Johnson & Phillips Ltd. 85

Key Engineering Co. Ltd. 34

L.P.S. Electrical Co. Ltd. 90
Ley's Malleable Castings Co. Ltd. ... 83
Litholite Insulators & St. Albans Mouldings Ltd. 88
Liverpool Electric Cable Co. Ltd. ... 100
Logan, W., & Co. Ltd. 118
Londex Ltd. 68

Martindale Electric Co. Ltd. 65
Mersey Cable Works Ltd. 21
Metropolitan-Vickers Electrical Co. Ltd. 35
Metway Electrical Industries Ltd. 16, 96 & 114
Midland Dynamo Co. Ltd. 90
Midland Electric Mfg. Co. Ltd. ... 4
Midland Silicones Ltd. ... 55, 56, 57 & 58
Monmore Conduits Ltd. 19
Morris, John, Electrical Eng. Co. Ltd. 83

Neco Geared Motors Ltd. 27
Neo Electrical Industries Ltd. 118
New Switchgear Construction Co. Ltd. 99
New Welbeck Ltd. 64
Newton Bros. (Derby) Ltd. 53

Oldfield Electrical Repairs 116
Oliver Pell Control Ltd. 77
Ormond Eng. Co. Ltd. 14
Otter Controls Ltd. 88

Pearce, A. (B'ham) Ltd. 95
Permali Ltd. 30
Philips Electrical Ltd. 93
Plessey Co. Ltd. 42

Quicksilver Tube Mfg. Co. 28

Rawlings Mfg. Co. Ltd. 23
Reed Corrugated Cases Ltd. 12
Reyrolle, A., & Co. Ltd. 91
Richardsons Westgarth (Hartlepool) Ltd. 8
Robinson, D., & Co. 95
Robinson, L., & Co. Ltd. 83
Rolco Engineering Ltd. 102
Rowlands Electrical Accessories Ltd. 32
Runbaken Electrical Products 28

Sanders, W., & Co. (Wednesbury) Ltd. 98
Scholes, Geo. H., & Co. Ltd. 94
Shell-Mex & B.P. Ltd. 78
Siemens Edison Swan Ltd. 63
Silentbloc Ltd. 51
Simplex Electric Co. Ltd. ..... 49 & 71
Sims, F. D., Ltd. 72
Smith Meters Ltd. 66
Sperryn & Co. Ltd. 46
Standard Telephones & Cables Ltd. 15
Statter, J. G., & Co. Ltd. 41
Stewart Transformers Ltd. 72
Sunvic Controls Ltd. 84

Termination Equipment Co. Ltd. ... 117
Thermal Elements 95
Thermal Syndicate Ltd. 10
Thomas (Richard) & Baldwins Ltd. Cover *2*
Transformer & Electrical Co. Ltd. 88
Troughton & Young (Lighting) Ltd. 38
Tubewrights Ltd. 72
Turnock, Geo., Ltd. 19

Universal Electrical Co. 118
Utilities (London) Ltd. 20

V.G. Porcelain Co. Ltd. 86
Victor Products (Wallsend) Ltd. .. 67
Volex Electrical Products Ltd. 29

Wades (Halifax) Ltd. 80
Wandleside Cable Works Ltd. 26
Weir, G. & J., Ltd. 31
West Insulating Co. Ltd. 96
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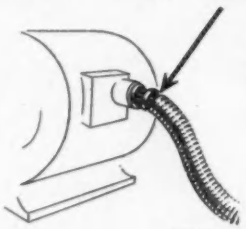

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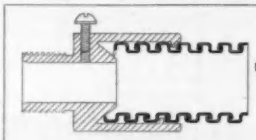

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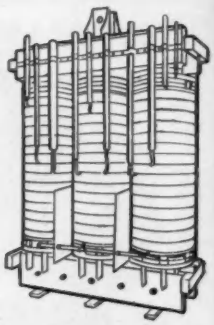

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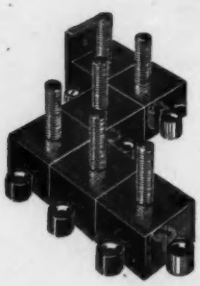

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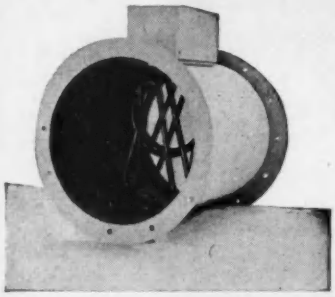

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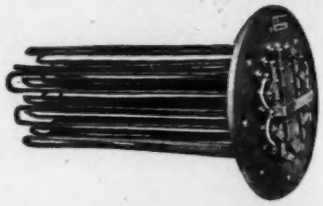

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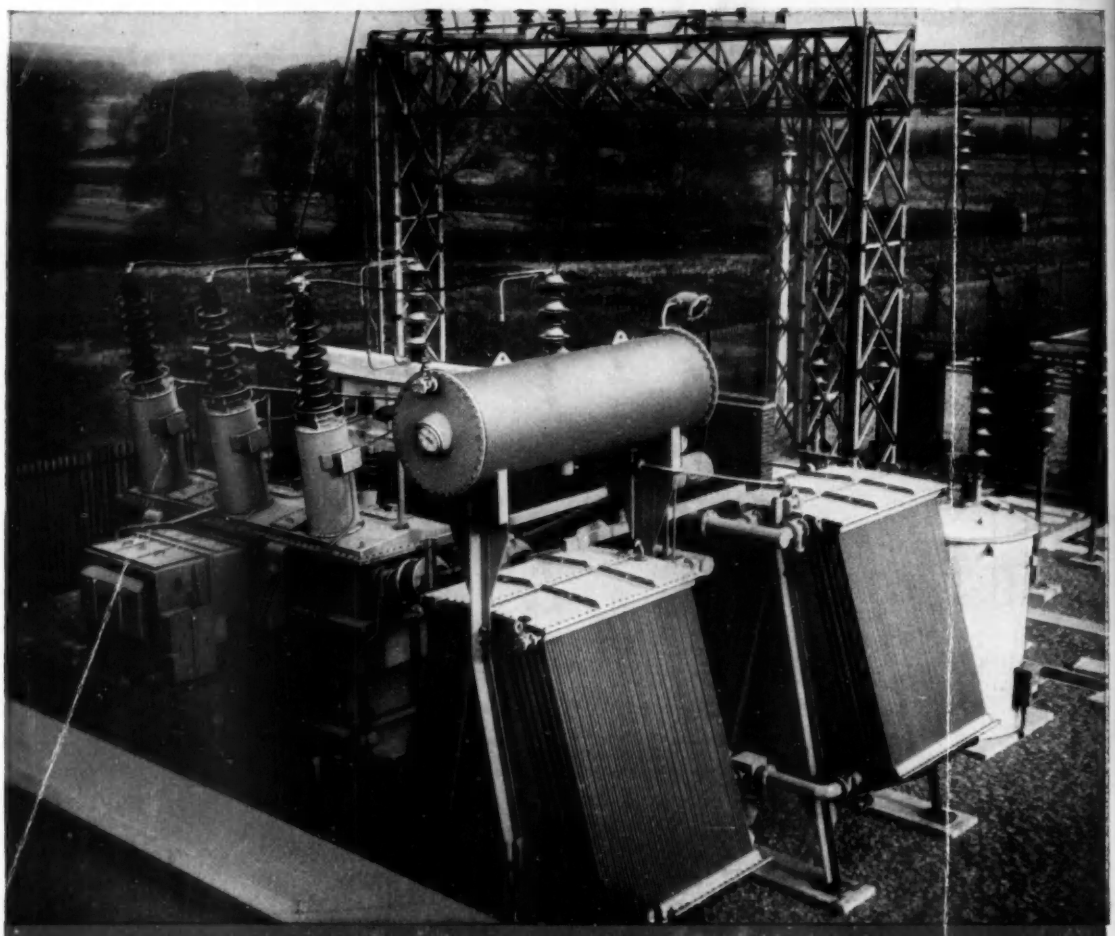

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